

## Avifaunas of the Kumawa and Fakfak Mountains, Indonesian New Guinea

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**SUMMARY.**—Of the 11 outlying mountain ranges along New Guinea's north and north-west coasts, the Kumawa and Fakfak Mountains are those most isolated from the Central Range and from other outliers by flat lowlands almost at sea level. The Kumawa Mountains were previously unexplored ornithologically, and the Fakfak Mountains unexplored above 900 m. We report four surveys conducted in 1981, 1983 and 2013. The known combined avifauna is now 283 species, including 77 upland species of which the two ranges share at least 57. Among Central Range upland species whose geographic and altitudinal ranges make them plausible candidates to have colonised Fakfak and Kumawa, 15 are nevertheless unrecorded in both Fakfak and Kumawa. Of those 15, 13 are also unrecorded in the mountains of Yapen Island, which at Pleistocene times of low sea level was also separated from other New Guinea mountains by a wide expanse of flat lowlands. This suggests that colonisation of isolated mountains by those particular upland species depends on dispersal through hilly terrain, and that they do not disperse through flat lowland forest. Because of the low elevation, small area and coastal proximity of the Kumawa and Fakfak Mountains, avian altitudinal ranges there show the largest Massenerhebung effect (lowering) of any New Guinea mainland mountains known to us. We compare zoogeographic relations of the Fakfak and Kumawa avifaunas with the mountains of the Vogelkop (the nearest outlier) and with the Central Range. Mixed-species foraging flocks are of two types: small insectivorous flycatchers and warblers, and larger brown and black omnivores. We provide preliminary descriptions and four photographs of 14 distinctive undescribed taxa or pairs of taxa that we observed in the field, and that await collection and naming, in addition to the three endemic taxa already described. An appendix lists, for all 283 known species, the records, local names in the Baham language where known, and altitudinal ranges and abundances on each of our four transects.

The mountains of the island of New Guinea consist of the Central Range that forms the island's east / west backbone, plus 11 isolated smaller and lower ranges along the north and north-west coasts (Fig. 1). New Guinea supports a rich upland avifauna, with nearly 200 bird species or superspecies confined to mountains and absent from the flat lowlands. For these upland species, the outlying mountain ranges, separated from each other and from the Central Range by intervening lowlands, constitute virtual islands of upland habitat. They offer an opportunity to study problems of island biogeography within a mainland setting (Brown 1971).

One such problem is to understand species differences in colonisation and distribution: why are some species much more widely distributed than others? For instance, some upland species, e.g. Mountain Fruit-Dove *Ptilinopus bellus* and White-eared Bronze Cuckoo *Chalcites meyerii*, occupy all 11 outlying ranges. Others, e.g. Mountain Kingfisher *Syma megarhyncha* and Slaty-headed Longbill *Toxorhamphus poliopterus*, occur on only 1–2 outlying mountains, respectively, and have not been recorded on other mountains within their altitudinal and

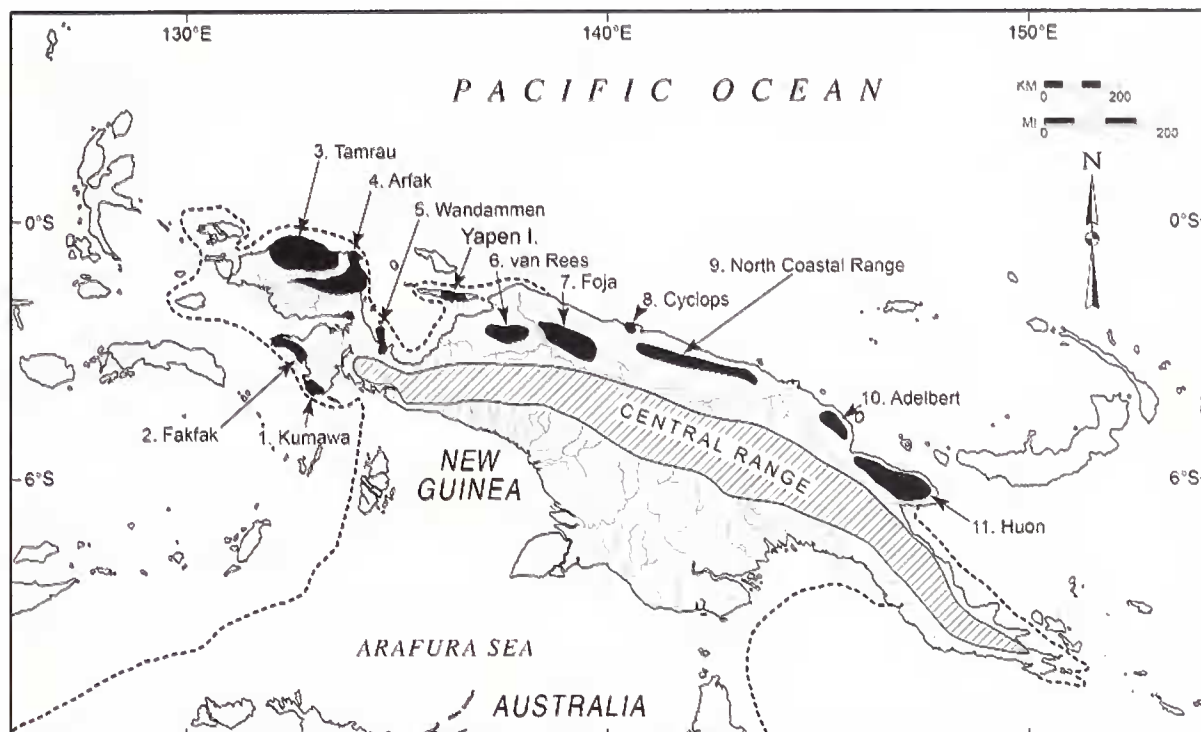


Figure 1. Map of New Guinea (modified from Diamond 1985), showing the main mountain ranges: the Central Range (cross-hatched); the 11 outlying ranges on the north and north-west coasts of the New Guinea mainland (numbered and in solid black); and the mountains of Yapen Island (also solid black). The dashed line marks the limits of the New Guinea / Australia continental shelf. During Pleistocene times of low sea level, the shelf, which is now a shallow sea, was a dry-land extension of the New Guinea mainland, so the mountains on Yapen Island were then a twelfth outlying range on the mainland.

geographic range, despite being readily detectable. Another problem is to understand differences in the evolution of endemism: some species occupy many mountains as a single subspecies (e.g., Red-breasted Pygmy Parrot *Micropsitta bruijnii* and Red-collared Myzomela *Myzomela rosenbergii*), while others are divided into many subspecies or even different allospecies on different mountains (e.g., the four allospecies of the Smoky Honeyeater superspecies *Melipotes*). Under current taxonomy, the outlying mountains support two endemic full species (Vogelkop Whistler *Pachycephala meyeri* and Emperor Bird of Paradise *Paradisaea guilielmi*), 14 endemic allospecies within nine superspecies, and many endemic subspecies. Why do species or superspecies differ so markedly in their proneness to geographic variation?

Of the 11 outlying ranges, the Fakfak and Kumawa Mountains are among the smaller in area and among the lower ones in elevation: the Fakfaks (c.1,400 m high) are the second lowest, and the Kumawas (1,654 m) tie for third lowest. However, four features make them of special interest. First, they comprise by far the most isolated upland habitats, being separated by 50–75 km of completely flat lowlands almost at sea level from the nearest hilly terrain of the Central Range, and by 30 km of flat lowland terrain from each other. In contrast, of the other outlying ranges, seven are connected by low hills to the Central Range, from which the other two (the Adelberts and Huon Peninsula) are separated by only narrow strips of flat lowlands. This difference, combined with knowledge of the composition of the Fakfak and Kumawa upland avifaunas, may illuminate mechanisms by which upland species colonise outlying ranges. Second, if one considers the outlying ranges as being distributed along a segment of a distorted circle along New Guinea's north and north-west coasts, the Fakfak and Kumawa Mountains define the south-west end of it. Third, the Fakfaks and Kumawas are those outliers with by far the most karstic terrain, which explains their



abundant populations of an otherwise rare and little-known New Guinea bird species, Greater Melampitta *Megalampitta gigantea*, a karst specialist (Diamond 1983). Finally, they support populations of Vogelkop Bowerbird *Amblyornis inornata* whose bower form and decorations differ greatly from those of morphologically nearly identical conspecific populations in other mountains (Fig. 2).

Prior to our surveys, the Kumawa avifauna was wholly unknown, while knowledge of the Fakfak avifauna was based only on two small collections made at low elevations in 1896 without field observations. The paucity of earlier surveys was partly due to the dangers formerly posed by the inhabitants of the Fakfaks (cf. Doherty's account in Rothschild & Hartert 1901), and partly to the physical and logistical difficulties of penetrating inland across karstic terrain without surface water to reach the highest peaks.

This paper describes our four surveys: one of the Fakfak Mountains (by JD in 1981) and three of the Kumawa Mountains (two by JD in 1983, and one by JD & KDB in 2013). In 2013 we reached the highest Kumawa summit, while in 1981 JD reached an elevation c.85 m below the highest Fakfak summit. Subsequent to Diamond's 1981 Fakfak survey, Gibbs (1994) and Rheindt (2012) surveyed Fakfak birds in 1992 and in 2008 and 2009 respectively. In Table 1 we list all 283 bird species recorded from the Fakfak and Kumawa Peninsulas, as well as presenting notes on 71 species of interest, and offer a preliminary biogeographic discussion of the avifaunas.



Figure 2. Bower of Vogelkop Bowerbird *Amblyornis inornata*, Central Kumawa, New Guinea, March 2013; note the tower of sticks glued together, the four *Pandanus* leaves propped against the tower's base, and (at JD's feet) the rectangular row of pieces of buff-coloured clay (K. D. Bishop)

## Background

**Environment.**—At seven weather stations in the Fakfak/Kumawa area, all of them at low elevations on or near the coast, mean annual rainfall varies from 214 to 388 cm, i.e. drier than average for New Guinea (Brookfield & Hart 1966). Presumably, rainfall is greater at higher elevations, where there are no weather stations in our area. Monthly rainfall in the locally wetter months of December–May is 2–4 times greater than in the drier months of July–November.

Karst terrain, associated with an absence of streams and other surface water, is locally widespread in the area, including on all four transects (see below). Our North Kumawa transect was entirely within karst and entirely without surface water; JD depended on rain and lianas for water during his survey. On our Central Kumawa transect, the only surface water was the marsh at our Marsh Camp in a basin without entrance or exit streams. On our South Kumawa transect there was no surface water beyond a stream rising at 490 m, but nearby was a river with a waterfall above which were several cascades visible from the air

and on GoogleEarth. Our Fakfak transect had two small streams at 680 m and 745 m, and a few forest pools at lower elevations. While mountains rise directly from the coast around most of the perimeter of the Fakfak (or Onin) and Kumawa (or Bomberai) Peninsulas, the east side of the Kumawa Peninsula east of the base of the mountains consists of extensive flat alluvial lowlands traversed by east-flowing rivers draining the mountains.

In areas without human disturbance the natural vegetation covering the Fakfaks and Kumawas consists almost entirely of forest. The only exceptions we saw were several small marshes with standing water in small basins at elevations of 790–1,010 m in the Central Kumawas. One of those was the site of our Marsh Camp, where we could observe the water level rising and falling from day to day in synchrony with rainfall. Anthropogenic second growth and coconut plantations are widespread in the many coastal villages and towns of the Fakfak Peninsula, but on the Kumawa Peninsula are confined to the vicinity of a few coastal villages (see *People and languages*), plus a narrow coastal strip that had been logged commercially at the northern (beach) terminus of our North Kumawa transect.

Forest composition on our Fakfak transect was studied by the forester H. Makabory, who accompanied JD. There were few tree ferns, little ground moss, thin soil, and much leaf litter at low elevations because fallen leaves that land on hot karst rock tend to dry out and then decompose very slowly. Forest canopy was 20–30 m high and dominated by *Pometia acuminata*, *P. coreaceae*, *P. pinnata*, *P. tomentosa*, *Sterculia macrophylla*, *Intsia palembanica*, *I. bijuga* and *Anisoptera polyandra*. Above the canopy towered *Araucaria cunninghamii* up to 49 m tall and 130 cm in diameter. Other common trees were *Casuarina montana*, *Cinnamomum massoia*, *Cupressus* sp., *Dillenia* sp., *Eugenia* sp., *Hopea papuana*, *Koordersiendeudron bogoriense* and *Wormia* sp., and (at higher elevations) *Agathis labillardieri*, *Nothofagus* sp. and *Quercus* sp. Trees growing on limestone in the Fakfaks were generally similar to those growing on limestone in the Arfaks, except for the rarity of *Palaquium amboinensis* in the former.

Forest composition at our North Kumawa transect was studied by the forester F. Sadsuitubun (Directorate General of Forestry 1975), who accompanied JD. Common lowland tree species were *Albizzia falcata*, *Alstonia scholaris*, *Burckella* sp., *Calophyllum* sp., *Cananga odorata*, *Canarium indicum*, *Intsia bijuga*, *I. palembanica*, *Palaquium* sp., *Piriteria* sp., *Planchonella* sp., *Pometia pinnata*, *Spondias cytherea* and *Teruinalia* sp. Common species at higher elevations were *Anisoptera polyandra*, *Casuarina montana*, *Elaeocarpus* sp., *Intsia* sp., *Octomeles sumatrana*, *Palaquium* sp., *Podocarpus nereifolia* and *Spondias dulcis*. Sadsuitubun observed *Agathis labillardieri* and *Araucaria cunninghamii* elsewhere in the Kumawas, in non-karst wetter areas, and we observed *Araucaria* on ridges above our Central Kumawa Marsh Camp.

*People and languages.*—Today, the Fakfak Peninsula's human population lives almost entirely in lowland villages, as well as in the growing town of Fakfak on the south coast. Formerly, the mountains were also inhabited, and the collector William Doherty encountered hundreds of mountaineers during his 1896 visit. As is true in coastal mountains elsewhere in New Guinea, one reason why people formerly lived in the mountains was to avoid the risk of murderous attacks and slave-hunting expeditions to which sea-going raiders constantly exposed coastal peoples. But the former Fakfak mountaineers, like New Guinea coastal mountaineers elsewhere, have abandoned their mountain villages and moved to the coast, on their own initiative and urged by the government, in order to gain access to stores, schools and medical care. By the time of Diamond's 1981 visit, the sole remaining mountain village still inhabited on the Fakfak Peninsula was the small settlement of Wanggasten. Local informants showed Diamond the site of another former mountain village called Siembra, and mentioned another such village, Rombena, which was also mentioned to Rheindt (2012), both abandoned (according to the informants) between 1967 and 1971.



While the widespread language of the Fakfak Peninsula is now Indonesian, three indigenous languages are still spoken locally (Lewis 2009): the Austronesian language of Onin, with 500 recent speakers, on the peninsula's western tip and around Fakfak town; and the Papuan languages Iha and Baham, which are related to each other, with 5,500 and 1,100 recent speakers in the peninsula's western and eastern halves, respectively. Several additional indigenous languages, each with a few hundred speakers, are spoken on three islands just south of the peninsula and on the north-east coast.

In contrast to the (former) habitation of the Fakfaks, the Kumawa Mountains are entirely uninhabited today, and early 20th-century Dutch maps also mark no villages. No signs of present or former human use were visible to us from the air, nor did we encounter any signs on the ground during our three visits. The reasons are readily understandable from the terrain: the lack of surface water in the north and the steep karst topography of most of the south. A single village, Nusawulan, is sited on Nusawulan Island and on the adjacent mainland coast at the peninsula's southern tip. This is the sole village from which it is possible to ascend into the southern slopes of the Kumawas, which rise steeply immediately from the south coast. Nusawulan inhabitants speak the Baham language spoken in the eastern Fakfaks, and claim that their ancestors moved from the Fakfak area to Nusawulan about three generations before Diamond's 1983 visit. Several other villages are located on the Kumawa Peninsula's east coast but are separated by c.30 km of flat lowlands from the Kumawas' easternmost foothills.

All of Diamond's local informants in 1981 and 1983 spoke the Baham language: from New Weri and Wanggasten villages in the Fakfaks, and from Nusawulan village in the South Kumawas. We present lists of Baham bird names that Diamond recorded from these informants (Appendix).

*Other ornithological studies.*—In addition to our studies, there have been five other studies or collections in Fakfak, and one in Kumawa.

*Fakfak.*—Prior to Diamond's 1981 visit, during three months of 1896–97 William Doherty collected 97 species for the Rothschild museum while based at Sekru near the present town of Fakfak (Rothschild & Hartert 1901: 56–57). Doherty's letters state that he collected up to elevations of at least 900 m, but was limited by hostile natives. Most of his specimens evidently came from low elevations, because he obtained only eight upland species, all of which Diamond found at elevations below 790 m.

Karl Schädler collected 76 species for the Leiden museum while also based at Sekru in the same months of 1896–97 as Doherty (Finsch 1900). He evidently remained at low elevations, because his collections include just one species confined to uplands in this area (Trumpet Manucode *Phonygammus keraudrenii*), which JD found to descend to 400 m.

While based at Fakfak and the nearby Kaukas, C. L. J. Palmer van den Broek & P. J. van Cloven collected birds presented to the Leiden museum in 1908 (van Oort 1909). Unfortunately, most of their specimens were unlabeled, and some of these are of species or subspecies confined to other parts of New Guinea, while two of the species that van Oort reported as 'evidently from Fakfak' probably do not occur there (New Guinea Vulturine Parrot *Psitttrichas fulgidus* and Masked Bowerbird *Sericulus aureus*). Of the 19 species labeled as 'Fakfak' or 'Kaukas', all are lowland species and all were subsequently observed in Fakfak by JD and / or D. Gibbs except Eastern Great Egret *Ardea modesta* and Large-tailed Nightjar *Caprimulgus macrurus*, both of which JD observed in Kumawa and whose presence in Fakfak would be unsurprising. Because of the uncertainties about collecting locality, we do not discuss Palmer van den Broek's and van Cloven's collections further.

Subsequent to JD's 1981 visit, D. Gibbs observed 106 species during eight days in September 1992 along a trail cut by oil exploration teams from the coast up to and over the

Fakfak summit (c.1,400 m). In two visits in August / September 2008 and June 2009 totalling nine days, reaching elevations of 950 and 1,300 m, respectively, F. Rheindt observed 147 species. Gibbs and Rheindt did not collect specimens. Because Gibbs reached higher elevations than Diamond or any other observer, he recorded 12 high-elevation bird species recorded there by no one else (see Appendix).

*Kumawa*.—In 1948–49 Sten Bergman spent three weeks collecting on the east coast of the Kumawa Peninsula at Kambala village (133°25'E, 03°52'S), in flat lowlands far from the mountains (Gyldenstolpe 1955). He collected or observed 51 species, all of them species of lowlands or coasts, and all but five were subsequently observed by us.

*Present surveys*.—We carried out one Fakfak survey and three Kumawa surveys of birds, all of them jointly with forest surveys by staff of the Indonesian Forestry Department, Environment Department, or both. The coordinates that we provide below for our sites were determined by GPS during our 2013 Central Kumawa survey, but are estimates derived from maps for our other three surveys, when GPS was not available.

*Fakfak, 1981*.—JD and the forester H. Makabory arrived at the town of Fakfak on 17 February. After four days on the coast nearby, on 21 February they went by boat to the coastal village of New Weri south-east of Fakfak (c.132°38'E, 03°13'S), where they obtained carriers. Setting out on foot on 22 February, they reached a forest campsite at 620 m. (This and all other elevations measured by us and cited here were determined with Thommen altimeters in feet, and are converted to metres and reported as the average of multiple readings at each site on different days.) On 23 February they reached Wanggasten village at 690 m (c.132°42'E, 03°07'S) and on 27 February their highest campsite in forest at 1,210 m (c.132°39'E, 03°03'S), where they remained four nights, each day climbing to 1,315 m. They descended to Wanggasten on 3 March, to a forest campsite at 360 m on 5 March, and to New Weri and then by boat on 6 March to Fakfak, from which they departed on 8 March.

*North Kumawa, 1983*.—This survey was undertaken by JD, F. Sadsuitubun of the Indonesian Forestry Department, and A. Irwanto of the Indonesian Environment Department. Following an aerial reconnaissance of the Kumawa Mountains, they and their carriers arrived from Fakfak by boat, and on 25 August established Camp 1 on a beach in the south-east corner of Teluk Sebakor (Sebakor Bay), on the north coast of the Kumawa Peninsula (c.132°54'E, 03°39'S). Over the next 14 days, proceeding south-southeast on a compass bearing of 160°, they cleared trail and moved to a series of nine camps: Camps 2–10, on 28, 29, 31 August, 1, 2, 4, 5, 6 and 8 September, respectively, at elevations of 260, 405, 520, 580, 555, 740, 690, 800 and 905 m, respectively. The highest elevation reached was 938 m, beyond Camp 10, which was estimated to be c.11 km from the coast (c.132°55'E, 03°46'S). Overland progress was slow because of the undulating karst terrain and the complete lack of water other than lianas and occasional rain. On 10 September the group descended to Camp 4, on 11 September to Camp 1 on the beach, and on 12 September they departed by boat.

*South Kumawa, 1983*.—This survey was undertaken by JD, while A. Irwanto performed conservation surveys. Whereas the ascent inland from the beach in North Kumawa was very gradual, such that an elevation of just 938 m was reached after 11 km, the ascent inland from the beach in South Kumawa was steep, such that an elevation of 1,438 m was reached after only 5 km. On 16 September, JD and 12 carriers travelled by boat from Fakfak to Nusawulan village on the beach at the south tip of the Kumawas opposite Nusawulan Island (c.132°58.8'E, 04°06.4'S, *per* C. Thébaud). On 17 September they transferred to the beach opposite Kerowagi Island (c.133°02'E, 04°04'S). On 18 September they made two trial ascents from Air-Keser beach and Fatukama beach; the latter was less rocky. Camp 1 was established on Fatukama beach (133°04.05'E, 04°03.33'S, *per* C. Thébaud). On 19 September,



proceeding inland from Fatukama beach on a bearing of 350°, they climbed to Camp 2 near a stream (the highest surface water encountered on this transect) at 485 m. On 20, 21 and 24 September they reached Camps 3, 4 and 5 at 923, 1,137 and 1,390 m, respectively. The highest elevation reached was 1,438 m on the crest of the ridge above Camp 5 (c.133°04.46'E, 03°59.30'S *per* V. Broissart). On 28 September they descended to Fatukama beach, transferred to Kerowagi beach, and surveyed the three small Baniki islets offshore. On 29 September they surveyed Kerowagi Island and a waterfall on the mainland opposite Kerowagi Island, before returning to Nusawulan village that afternoon and returning by boat to Fakfak on 30 September.

*Central Kumawa, 2013.*— This expedition, the last, was led and planned by R. Sneider and JD, joined by KDB, M. Ammer and T. Kammeyer, with the participation of the Indonesian Forestry Department. The approximate location of the highest Kumawa peak was already known from JD's 1983 aerial reconnaissance flight. Sneider & JD located this peak more precisely using GoogleEarth, and Ammer confirmed it during another reconnaissance flight in January 2013. On 5–11 February 2013, Sneider, Ammer and Kammeyer used a helicopter to establish two camps: Top Camp at 1,654 m on the summit itself (133°00'32"E, 03°55'02"S) and Marsh Camp in a natural clearing at 1,026 m consisting of a marsh-filled basin encircled by hills (133°02'52"E, 03°55'13"S). Three other such marshy clearings at similar elevations were located by aerial reconnaissance within 10 km. On 13 March 2013 all five personnel, plus three Dani field assistants, flew by helicopter to Top Camp, where JD & KDB spent the next four days surveying birds on or near the summit. On 18 March the helicopter returned, brought JD, KDB, Kammeyer and the three Dani men to Marsh Camp, and departed with Sneider & Ammer. For the next eight days JD & KDB surveyed birds from Marsh Camp up to 1,210 m. On 27 March the helicopter flew us out of Marsh Camp.

*Methods.*— We made observations while walking trails that we cut, stopping at fruiting and flowering trees where birds gathered, and noting altitudes measured by Thommen altimeters and (in Central Kumawa) using a Garmin GPS. We recorded vocalisations with Sony TCM 5000 EV tape-recorders, played back unidentified vocalisations in the field to attract and identify the authors, and re-listened to recordings in camp each day because our directional microphones often captured vocalisations not noticed in the field. Forestry Department personnel operated mist-nets at North Kumawa Camps 9–10 and South Kumawa Camps 4–5. Those birds trapped were weighed and measured. All were then released in North Kumawa and most in South Kumawa. From 39 South Kumawa birds retained as specimens in the Museum Zoologicum Bogoriense, Bogor, three new subspecies were described previously (Smoky Robin *Peneothello cryptoleucus maximus*, Sclater's Whistler *Pachycephala soror octogenarii* and Smoky Honeyeater *Melipotes* cf. *fumigatus kumawa*; Fig. 4) by Diamond (1985). The present paper does not name other new taxa. Diamond (1985) also reported 16 records of distributional interest for Fakfak and 28 for Kumawa. Our other prior publications based on our Fakfak and Kumawa studies were accounts of *Megalampitta gigantea* (Diamond 1983), and of bower-building by *Amblyornis inornata* (Diamond 1986, 1987a, 1988).

## Species list

The Appendix summarises available information for the 283 species recorded in the Fakfaks and Kumawas, considering the two ranges separately. For each species, column 2 indicates whether the species was recorded in each of our four surveys, in the four other Fakfak surveys (by Doherty, Schädler, Gibbs, and Rheindt), and in Bergman's Kumawa survey. Column 3 categorises abundance in four categories, from the least abundant to most abundant species (categories 1–4), in each of our four surveys. Column 4 provides

altitudinal ranges in each of our four surveys. Column 5 presents two sets of bird names in the Baham language: the names given by informants in the Fakfaks and those given at Kumawa's Nusawulan village. Our nomenclature follows that of Pratt & Beehler (2014).

## Upland species

**Definition.**—The published literature concerning avian distributions on tropical mountains commonly refers to 'montane species'. A common-sense definition of a montane species is 'a species confined to the mountains, and absent at sea level'. For example, Beehler *et al.* (1986) considered as montane those New Guinea birds largely confined to elevations above 1,000 m, whereas Archbold & Rand (1935: 542) identified a break at 1,700 m. Other more finely divided classifications split a separate hill avifauna below the montane avifauna, or split the montane zone into lower (0 to 600–700 m), middle (800–1,500 m) and upper (above 1,500–2,000 m) montane zones (Stresemann 1923).

Such definitions would be unambiguous if New Guinea bird species fell into two or more cleanly divided groups: e.g., to take the simplest twofold classification, species occurring from sea level upwards ('lowland species') vs. species confined to elevations above some particular altitude such as 1,000 m or 1,700 m ('montane species'). In reality, quantitative analysis reveals that altitudinal floors of New Guinea bird species are distributed continuously, from sea level to 3,800 m (Diamond 1972: 67–70). We see no value to considering species as montane only if their altitudinal limit exceeds some arbitrary value, e.g. 1,500 m.

Instead, we distinguish between two categories of species: 'lowland species' vs. 'upland species', meaning 'those species present in' vs. 'those species absent from' the flat lowlands at or near sea level. All species absent from the flat lowlands are considered upland species, irrespective of whether their lower altitudinal limit is 500 m or 3,500 m. This definition has the advantage of recognising a biologically significant attribute: the ability or inability to exist or disperse in the flat lowlands at sea level seems to have had an important influence on the composition of the Fakfak and Kumawa avifaunas (see below). Of course, putting our definition into practice poses its own sources of ambiguity, but they are minor compared to the complete arbitrariness of categorising species by whether their lower altitudinal limits lie above or below 800, or 1,500 m, or some other arbitrary elevation.

The five principal sources of ambiguity that we encountered in applying our definition were as follows. First, some species (e.g., Ornate Fruit-Dove *Ptilinopus ornatus*, Papuan Mountain Pigeon *Gymnophaps albertisii*) breed at high elevations but descend to the lowlands post-breeding. We consider such species as upland.

Second, some species (e.g., *Psitttrichas fulgidus*, Torrent Flycatcher *Monachella muelleriana*, *Sericulus aurens*) inhabit sloping hilly terrain and descend to elevations only slightly above sea level in such terrain, but are absent from flat lowlands at or near sea level. We consider such species as upland.

Third, how gentle a slope must a terrain have in order to be considered 'flat', and how many records from 'flat lowlands' suffice to disqualify a species as upland? These questions cause species of the lower hill slopes to include borderline cases. Among them, we consider Pheasant Pigeon *Otidiphaps nobilis*, Papuan Cicadabird *Edolisoma incertum* and Magnificent Bird of Paradise *Diphyllodes magnificus* as upland, but Chestnut-breasted Cuckoo *Cacomantis castaneiventris*, Pale-billed Scrubwren *Sericornis spilodera* and Fairy Gerygone *Gerygone palpebrosa* as lowland.

Fourth, some New Guinea species occur at sea level in the flat lowlands of the Fly River in southern New Guinea, but are confined to elevations above 600 m or higher in northern New Guinea, the Fakfaks and Kumawas. These include White-faced Robin *Tregellasia*



*leucops*, Yellow-legged Flycatcher *Kempiella griseiceps*, *Phonygammus keraudrenii*, Black-eared Catbird *Ailuroedus melanotis*, Spotted Honeyeater *Xanthotis polygrammus* and New Guinea White-eye *Zosterops novaeguineae*. We consider such species as upland in our study area, plus northern New Guinea.

Finally, Hooded Pitohui *Pitohui dichrous* and possibly some other species, while confined to elevations above 600 m in most of northern New Guinea, plus the Fakfaks and Kumawas, occur in flat lowlands not only in the Fly River bulge but also locally in several other localities. We consider *Pitohui dichrous* as upland.

Accordingly, approximately 77 species of the Fakfaks or Kumawas, or both, noted by an asterisk in the Appendix, rate as upland.

**Differences between the Fakfak and Kumawa upland avifaunas.**—The two avifaunas are largely similar. Of 77 upland species recorded in one or both ranges, 57 were found in both the Fakfaks and Kumawas, 12 only in the Kumawas and eight in the Fakfaks alone (Table 1). To interpret this apparent difference, we first consider to what extent it is probably real.

The best-attested cases of species that probably occur in only one of the two ranges involve three noisy and common species, each of which descends in the relevant range to altitudes that have already been well surveyed in the other range wherein the species has not been recorded. The species are White-striped Forest-Rail *Rallicula leucospila* and Ashy Robin *Heteromyias albispecularis*, recorded on both Kumawa transects (North and Central Kumawa) that reached its altitudinal range, but not recorded in Fakfak, and Goldenface *Pachycare flavogriseum*, which was abundant and noisy in Fakfak down to 787 m, but was not recorded on any of our three Kumawa transects although all three reached elevations above this.

TABLE 1  
Upland species recorded only in Fakfak or Kumawa, but not in both ranges.

		Fakfak	Kumawa	Notes
White-striped Forest-Rail	<i>Rallicula leucospila</i>	no	yes	noisy, common
Bronze Ground-Dove	<i>Alopecoenas beccarii</i>	no	yes	silent, cryptic, rare
Rufous-throated Bronze Cuckoo	<i>Chalcites ruficollis</i>	no	yes	sings in canopy, rare
Mountain Owlet-Nightjar	<i>Aegotheles albertisi</i>	no	yes	nocturnal, uncommon; calls
Feline Owlet-Nightjar	<i>Aegotheles insignis</i>	no	yes	nocturnal, uncommon; calls
Red Myzomela	<i>Myzomela cruentata</i>	yes	no	ephemeral at flowers
Spotted Honeyeater	<i>Xanthotis polygrammus</i>	yes	no	cryptic, rare
Olive Straightbill	<i>Timeliopsis fulvigula</i>	yes	no	cryptic, rare
Goldenface	<i>Pachycare flavogriseum</i>	yes	no	noisy, abundant
Large Scrubwren	<i>Sericornis nouhuysi</i>	no	yes	sings, rare; high altitudes
Grey-green Scrubwren	<i>Sericornis arfakianus</i>	?	no	abundant; identity uncertain
Streaked Berrypecker	<i>Melanochloris striativentris</i>	?	no	cryptic, rare
Barred Cuckooshrike	<i>Coracina lineata</i>	no	yes	calls in canopy, rare
Varied Sitella	<i>Daphoenositta chrysoptera</i>	yes	no	cryptic, rare
Paradigalla	<i>Paradigalla</i> sp.	?	no	cryptic, rare
Lesser Ground-Robin	<i>Amalocichla incerta</i>	no	yes	noisy, abundant; high altitudes
Garnet Robin	<i>Eugerygone rubra</i>	no	yes	sings, not cryptic; rare
Ashy Robin	<i>Heteromyias albispecularis</i>	no	yes	noisy, abundant
New Guinea White-eye	<i>Zosterops novaeguineae</i>	no	yes	abundant; identification hard when silent
Russet-tailed Thrush	<i>Zoothera heinei</i>	no	yes	silent, cryptic, rare

There are four types of uncertainties applying to the other 17 species recorded only from one of the two ranges. First, Large Scrubwren *Sericornis nouhuysi* was found in Kumawa only on the summit itself (1,654 m) and Lesser Ground-Robin *Amalocichla incerta* in Kumawa only above 1,260 m (South Kumawa) or above 1,110 m (Central Kumawa). In Fakfak the only observer to ascend above 1,280 m was Gibbs, and he reached such elevations only briefly in transit on two days. Therefore, longer surveys of high elevations in the Fakfaks are required to determine whether these two species really are absent there.

A second type of uncertainty applies to 12 species recorded in just one range, but cryptic or rare or both. Such species might simply have been overlooked in the other range, despite many days of survey time at appropriate altitudes. These include eight species recorded only in Kumawa (Bronze Ground-Dove *Alopecoenas beccarii*, Rufous-throated Bronze Cuckoo *Chalcites ruficollis*, Mountain Owlet-Nightjar *Aegotheles albertisi*, Feline Owlet-Nightjar *A. insignis*, Barred Cuckooshrike *Coracina lineata*, Russet-tailed Thrush *Zoothera heinei*, Garnet Robin *Eugerygone rubra* and Zosterops *novaeguineae*), plus four species recorded only in Fakfak (a paradigalla *Paradigalla* sp., Varied Sitella *Daphoenositta chrysoptera*, Olive Straightbill *Timeliopsis fulvigula* and *Xanthotis polygrammus*).

A third group comprises two species recorded only in Fakfak, but whose identification there was uncertain: Grey-green Scrubwren *Sericornis arfakianus* and Streaked Berrypecker *Melanocharis striativentris*.

The final uncertainty concerns Red Myzomela *Myzomela cruentata*, which was observed regularly in Fakfak but not seen in Kumawa. It gathers at flowering trees but is locally very uncommon or absent when no trees that it utilises are flowering, raising the possibility that it went unrecorded in Kumawa merely because suitable trees were not flowering during our visits. (Note added in proof: we are grateful to C. Thébaud and B. Milá for the information that they twice observed *Myzomela cruentata* in South Kumawa in November 2014.)

We guess that some of the 17 absences subject to these uncertainties are real, whereas others are artefacts of the species being overlooked in one of the two ranges. Further ornithological exploration will be required to resolve this uncertainty.

**Absentees.**—The New Guinea upland avifauna comprises c.190 species or superspecies (Diamond 1972). Approximately half of these could not be considered ‘good candidates’ for colonising Fakfak and Kumawa, for either of two reasons: their altitudinal range elsewhere does not descend to the summit elevations of the Fakfak and Kumawa, or their geographic range does not extend to westernmost New Guinea. Therefore, we restrict our attention to unequivocally ‘good candidates’ that possess a suitable altitudinal range (i.e. down to at least 670 m, thus providing an ample area of habitat at suitable elevations in both ranges) and a suitable geographic range (i.e. present in the Arfak Mountains of the Vogelkop Peninsula).

Of the 92 species that constitute ‘good candidates’ under these criteria, Fakfak and Kumawa support populations of 77. Table 2 lists the 15 suitable candidates not recorded from either range. Of those 15, we consider six to be so vocal or common, or both, wherever present (*Psitttrichas fulgidus*, Papuan Scrub-Robin *Drymodes beccarii*, White-rumped Robin *Peneothello bimaculata*, Green-backed Robin *Pachycephalopsis hattamensis*, Ornate Melidectes *Melidectes torquatus* and Obscure Honeyeater *Caligavis obscura*), that their apparent absences in both ranges are probably real. Three species (Salvadori’s Teal *Salvadorina waigiensis*, *Monachella muelleriana* and Torrentlark *Grallina bruijnii*) are specialists of fast-flowing mountain streams, which have not been surveyed in either range, although in aerial reconnaissance we spotted large mountain streams in Kumawa, so an opinion as to the presence of these three species must await surveys of those streams. Four species (Wallace’s Owlet-Nightjar *Aegotheles wallacii*, *Sericulus aureus*, Marbled Honeyeater *Pycnopygius*



TABLE 2

'Candidate' upland species recorded in neither Fakfak nor Kumawa. 'Candidates' are those New Guinea upland species with altitudinal and geographic ranges suitable for colonising the Fakfak and Kumawa Mountains, but the 15 species are nevertheless unrecorded in both ranges. The altitudinal lower limit (third column) is for the population in the Arfak Mountains or elsewhere in New Guinea. Fourth column: the number of outlying mountain ranges along the north coast that the species does occupy. Fifth column: does the species occur in the mountains of Yapen Island? Last column: factors influencing detectability. Note: most candidate species unrecorded in Fakfak and Kumawa are also unrecorded on Yapen, suggesting that there is a shared explanation.

		Altitudinal lower limit (m)	Number of outliers	Yapen?	Notes
Salvadori's Teal	<i>Salvadorina waigiuiensis</i>	100	4	no	mountain streams
New Guinea Vulturine Parrot	<i>Psitttrichas fulgidus</i>	foothills	7	no	very noisy
Pygmy Lorikeet	<i>Charmosyna wilhelminae</i>	500	2	no	ephemeral at flowers
Wallace's Owlet-nightjar	<i>Aegotheles wallacii</i>	100	2	no	nocturnal, uncommon
Masked Bowerbird	<i>Sericulus</i> superspecies	foothills	5	no	cryptic, rare
Elfin Myzomela	<i>Myzomela adolphinae</i>	800	3	no	ephemeral at flowers
Marbled Honeyeater	<i>Pycnopygius cinereus</i>	800	3	no	cryptic, uncommon
Obscure Honeyeater	<i>Caligavis obscura</i>	100	3	no	vocal
Ornate Melidectes	<i>Melidectes torquatus</i>	800	3	no	noisy
Torrentlark	<i>Grallina bruijnii</i>	800	5	no	mountain streams
(Green-backed) Robin	<i>Pachycephalopsis</i> superspecies	800	7	yes	vocal
Torrent Flycatcher	<i>Monachella niuelleriana</i>	foothills	5	no	mountain streams
Papuan Scrub-Robin	<i>Drymodes beccarii</i>	500	7	no	vocal
White-rumped Robin	<i>Peneothello bimaculata</i>	600	4	yes	vocal
Papuan Parrotfinch	<i>Erythrura papuana</i>	800	2	no	cryptic, rare

*cinereus*, Papuan Parrotfinch *Erythrura papuana*) are cryptic or rare, or both, and could have been overlooked in both ranges even if present. Two species (Pygmy Lorikeet *Charmosyna wilhelminae* and Elfin Myzomela *Myzomela adolphinae*) are nomadic flowering-tree specialists that might have been overlooked if suitable trees were not in flower at the time of previous surveys. Hence at least six, and possibly up to 15, species that are good candidates to occur in both ranges are nevertheless absent.

Taking these 15 apparent absences: is there any pattern to them? There might be none at all: colonisation involves a stochastic element and it may be mere chance that these particular 15 candidates failed, while the other 77 succeeded, and that no feature is shared by the 15 absentees. But considerations of how upland colonists move from one mountain to another suggest a possible factor beyond chance.

Three mechanisms of avian colonisation between mountains can be distinguished. One is to fly out from one mountain over the forest canopy, either heading for another visible mountain or flying off without a visible target in the hope of eventually locating one. This mechanism is especially likely for species whose normal foraging method involves long-distance flights high above the canopy, as is true of many frugivorous pigeons and nectarivorous parrots, which are well represented among Fakfak and Kumawa montane species. In fact, the absentees listed in Table 2 include only one such species (the nectarivorous parrot *Charmosyna wilhelminae*), meaning that such species are much more likely to be present than to be absent.

A second mechanism is juvenile dispersal through upland forests down to altitudes in the hills below breeding elevations (Diamond 1972: 30–31). This mechanism is likely to have been important for almost all of the New Guinea outlying mountain ranges, which

are connected to each other and to the Central Range by low hills. The exceptions are the Fakfaks and Kumawas, the only outliers completely separated from the Central Range and other outliers by a broad expanse (c.70–100 km) of flat lowlands close to sea level without any hills. Thus, for a species to reach the Fakfaks and Kumawas by dispersal through forests rather than by above-canopy flights, a third colonisation mechanism is required: dispersal through flat lowland forests. Could that mechanism be favoured by some upland species and not by others, and could the absentees in Table 2 be drawn especially from upland species that do not disperse via flat lowland forests?

We have no direct information about such dispersal and there is no other New Guinea mainland outlying mountain range that shares Fakfak's and Kumawa's isolation and thereby permits a test of our hypothesis. But a test is furnished by Yapen Island, which is one of the six large New Guinea satellite islands now separated from the mainland by such shallow seas that they must have formed part of the mainland during Pleistocene era low sea levels, which ended with worldwide glacial melting c.12,000 years ago. Yapen is the only one of the six islands with mountains exceeding 1,200 m, and its highest peak (1,496 m) is nearly as high as Fakfak's and Kumawa's summits. During much of the Pleistocene, what is now Yapen Island would have been part of the New Guinea mainland (Fig. 1) and its mountains would have been separated from the closest other mountains (the Van Rees range) by a 50 km-wide expanse of flat lowland forest, much as the Fakfak and Kumawa Mountains are today.

Approximately 21 upland species have been recorded on Yapen (JD unpubl.), of which all except two (Table 2: *Peneothello bimaculata* and *Pachycephalopsis hattamensis*) also occur in the Fakfaks and / or Kumawas. Of the 19 shared species, 17 occur both in Fakfak and Kumawa, i.e. Yapen's upland avifauna is very similar to a reduced fraction of the Fakfak and Kumawa upland avifaunas, both with respect to the species present on Yapen and those absent on Yapen. This parallel supports the hypothesis that poor dispersal via flat lowland forests contributes to explaining the absentees in the Fakfak and Kumawa (and Yapen) upland avifaunas, among the upland species of the Arfaks. Those three upland avifaunas were probably founded by a combination of colonists flying over the canopy, plus those dispersing via lowland forest.

**Massenerhebung effect.**—If one compares the altitudinal range occupied by a given bird species on different New Guinea mountains, one finds that species tend to occur at lower elevations in the Fakfaks and Kumawas than in any other New Guinea mainland ranges of which we have experience. This illustrates a phenomenon termed the Massenerhebung effect, first described in the Alps and since found to be widespread in the tropics: altitudinal ranges are lowered and compressed on small low mountains, especially near the sea, compared to large high mountains far from the sea (Whitmore 1990: 16, 147). The explanation is thought at least partly to involve lowering of the elevation at which cloud habitually forms. Compared to New Guinea's other outlying ranges, the Fakfaks and Kumawas are among the smallest, lowest, and closest to the sea. Therefore, it is understandable that the Massenerhebung effect is especially marked in the Fakfak and Kumawa Mountains.

For quantification and systematic analysis of this tendency, we tabulated lower altitudinal limits for all montane species in the Fakfaks and Kumawas on all four transects (see column 4 of the Appendix). We then discarded the less reliable limits: on our Central Kumawa transect, the limits of species present at our lower camp (Marsh Camp, 1,026 m) that might be expected also to occur at lower elevations, because we did not descend below Marsh Camp in Central Kumawa; on our South Kumawa transect, most species descending below 1,300 m, where JD spent little time; and most rare species, of which we had few observations. We averaged the Fakfak and Kumawa limits of each species over the 1–3



TABLE 3

Massenerhebung effect on altitudinal lower limits (in m). Examples of the Massenerhebung effect: comparisons of altitudinal limits on four or five New Guinea mountains, for nine species whose lower limits could be determined particularly accurately because they are vocal and abundant (abundance rank 3 or 4 in the Appendix). The multiple values for Fakfak and Kumawa, separated by commas, are for different transects. Fakfak and Kumawa are small, low, coastal outliers; Foja is a larger, higher, inland outlier; Mt. Karimui is a higher, inland, isolated peak of the Central Range; and the Snow Mountains form the largest and highest part of the Central Range. Note that limits tend to increase in that sequence, from Fakfak and / or Kumawa to the Snow Mountains. See text for discussion.

	Range →	Fakfak and / or Kumawa	Foja	Mt. Karimui	Snow Mts.
	Species ↓				
Mountain Fruit-Dove	<i>Ptilinopus bellus</i>	387, 810	1,070	990	1,200
Mountain Mouse-Warbler	<i>Crateroscelis robusta</i>	1,025	1,360	1,650	1,800
Brown-breasted Gerygone	<i>Gerygone ruficollis</i>	740, 787, 832	1,320	1,370	1,600
Black-bellied Cicadabird	<i>Edolisoma montanum</i>	786, 863	1,170	1,290	1,200
Fantailed Monarch	<i>Symposiachrus axillaris</i>	652, 774	730	1,110	1,200
Friendly Fantail	<i>Rhipidura albolimbata</i>	1,026	1,260	1,410	1,800
Lesser Ground-Robin	<i>Amalocichla incerta</i>	1,109, 1,262	1,300	1,820	2,200
Ashy Robin	<i>Heteromyias albispecularis</i>	845, 1,026	1,140	-	2,150
Island Leaf-Warbler	<i>Phylloscopus poliocephalus</i>	366, 552	950	1,310	1,200

transects that remained. We then compared these limits with two other sets of limits of the same species, determined on other mountains in western New Guinea: the inland face of the Foja Mountains (Beehler *et al.* 2012), an outlying range higher and larger than Fakfak and Kumawa, and lying further inland; and the northern slope of the Central Range above the Idenburg River in the Snow Mountains (Rand 1942), New Guinea’s highest and largest range, lying further inland than the Foja Mountains and facing them across the basin of the Lakes Plains. That left 43 species in Fakfak and / or Kumawa for analysis, compared to 40 of those species present in both the Foja and Snow Mountains, two of those species present just in Foja, and one present only in the Snow Mountains. The results were as follows.

Among the 42 species shared between Fakfak / Kumawa and Foja, the mean lower altitudinal limit was 230 ± 55 m (mean ± s.d.) lower in Fakfak / Kumawa than in Foja. Of the 42 pairs of values, for 25 species the limit was at least 150 m lower in Fakfak / Kumawa than in Foja; the max. was 1,100 m (for Blue-faced Parrotfinch *Erythrura trichroa*), a nomadic species whose presence and range depend on the availability of seeding bamboo.

Among the 41 species shared between Fakfak / Kumawa and the Snow Mountains, the mean limit was 488 ± 74 m lower in Fakfak / Kumawa than in the Snow Mountains. Of the 41 pairs of values, for 25 species the limit was at least 300 m lower in Fakfak / Kumawa than in the Snow Mountains; the max. was 1,545 m (for *Chalcites meyerii*).

Among 40 species shared between Foja and the Snow Mountains, the mean limit was 269 ± 70 m lower in Foja than in the Snow Mountains. Of the 40 pairs of values, for 28 species the limit was at least 150 m lower in Foja than in the Snow Mountains; the max. was 1,110 m (for *Micropsitta bruijnii*).

Table 3 illustrates these findings by listing altitudinal limits for nine abundant and conspicuous species with especially well-determined limits in Fakfak / Kumawa, Foja and the Snow Mountains: *Ptilinopus bellus*, Black-bellied Cuckooshrike *Edolisoma montanum*, *Amalocichla incerta*, Mountain Mouse-Warbler *Crateroscelis robusta*, Brown-breasted Gerygone *Gerygone ruficollis*, Island Leaf-Warbler *Phylloscopus poliocephalus*, Friendly Fantail *Rhipidura albolimbata*, Black Monarch *Symposiachrus axillaris* and *Heteromyias albispecularis*.

We also include in Table 3 the limits in another portion of the Central Range, Mt. Karimui of eastern New Guinea (Diamond 1972), which lies further from Fakfak / Kumawa and Foja than do the Snow Mountains, but where altitudinal ranges were determined much more precisely than in the latter. As shown in Table 3, altitudinal limits are somewhat lower on Mt. Karimui than in the Snow Mountains, which is consistent with Mt. Karimui being a smaller, lower and more isolated peak of the Central Range than are the Snow Mountains. However, the finding remains that, compared to Mt. Karimui, limits are on average lower in Foja, and even lower in Fakfak / Kumawa.

The Fakfaks and Kumawas are similar in elevation, area and proximity to the coast, so would not be expected to differ in Massenerhebung effects. In fact, of 26 species shared between our Fakfak and North Kumawa transects, all have lower recorded limits in North Kumawa, on average by  $225 \pm 30$  m, a difference as large as that between Fakfak / Kumawa and Foja. We consider that part of the apparent difference between our Fakfak and North Kumawa transects reflects the fact that JD spent much more time at low elevations in the latter than the former, meaning species were much more likely to be detected at low elevations in the Kumawas. However, in addition, eight of the 26 lower limits were for species whose Fakfak limits lay between 690 m and 1,190 m, where JD spent nine days. Hence the higher limits for the Fakfak transect are probably at least partly real. They may reflect either the possibly higher rainfall in Fakfak than in Kumawa (Brookfield & Hart 1966), or else effects of terrain on species' altitudinal ranges.

**Terrain differences.**—Between our three Kumawa transects we noted some differences in species distributions, especially between our Central Kumawa transect and the other two, which appeared to be related to differences in terrain. This comparison is limited because of differences in our coverage: we did not descend below 1,026 m in Central Kumawa, JD did not ascend above 938 m in North Kumawa, and below 938 m JD spent 18 days in North Kumawa but only six days in South Kumawa.

Terrain differences were as follows. The North Kumawa transect sloped gently upwards with small undulations, rising 938 m over 11 km, with a mean slope of 8.5%. The South Kumawa transect sloped much more steeply upwards with almost no undulations, rising 1,438 m in 5 km, with a mean slope of 29%. Our Central Kumawa transect descended from 1,654 m to terminate at 1,026 m in a basin encircled by hills, meaning that lowland species ranging up to 1,025 m would occur in the basin only if they reached at least 1,070 m (to cross the surrounding hills). These facts may explain why the well-studied Central Kumawa basin contained more high-altitude species and fewer low-altitude species than were present at comparable well-studied elevations on the other two transects. Five high-altitude species were present in the Central Kumawa basin at elevations 224–372 m below their altitudinal limits on the South Kumawa transect: *Amalocichla incerta*, *Crateroscelis robusta*, *Rhipidura albolimbata*, *Peneothello cryptoleuca* and Rufous-sided Honeyeater *Ptiloprora erythropleura*. Their presence at 1,026 m is unprecedentedly low for all of New Guinea. Fourteen species that were common up to at least 905 m or 938 m in North Kumawa (the elevation at which JD's transect ended) were absent in the Central Kumawa basin, although three (*Chalcites meyerii*, Hook-billed Kingfisher *Melidora macrorrhina* and *Edolisoma incertum*) were recorded up to 1,130–1,438 m in South Kumawa. Further observations are required to establish if these differences are real, but they would be unsurprising: large avifaunal differences resulting from differences in slope are well established for Mt. Karimui (Diamond 1972: 54–55).

**Few Kumawa summit species.**—Just three Kumawa upland species were observed at Central Kumawa's Top Camp with lower altitudinal limits above 1,438 m, the highest elevation reached in South Kumawa: *Ptilinopus ornatus*, Josephine's Lorikeet *Charmosyna*



*josefinae* and *Sericornis uoulunysi*. The probable reason is the small area of the Kumawa summit, such that species confined to the summit and not descending much below it would have a precariously small population size. Similarly, although the summit of the Foja Mountains is at 2,220 m and 12 Foja upland species have lower altitudinal limits between 1,620 m and 1,680 m, none has a lower altitudinal limit above 1,680 m (Beehler *et al.* 2012).

## Upland zoogeography

With the bird populations of which other New Guinea mountains do Fakfak and Kumawa upland bird populations have their closest relationships, as a result of either past ancestry or ongoing gene exchange? There are four potential sources of upland colonists. First, the Arfak and Tamrau Mountains of the Vogelkop Peninsula are large, high (up to 2,900 m) outlying ranges, lying in a straight-line distance c.190 and 280 km north of the Fakfaks and Kumawas, respectively. The 190-km straight-line distance to the Fakfaks includes c.100 km of flat lowlands, plus a 60-km shallow-water gap (MacCluer Gulf) that would have been flat lowlands during the Pleistocene. Secondly, the Bird's Neck connecting the Vogelkop Peninsula to the Central Range consists of ornithologically unexplored low mountains (up to 1,500 m) c.120 km east of the Kumawas, most of the gap being flat lowlands. Third, the Wandammen Peninsula is a small, high, outlying range (up to 2,250 m) connected to the Bird's Neck and c.230 km east-northeast of the Fakfak and Kumawa Mountains. Finally, the nearest ornithologically explored high mountains of the Central Range are the Weylands (up to 3,200 m), 260 km east of the Fakfaks and Kumawas.

Large collections of bird specimens are available from the Arfak, Tamrau, Wandammen, and Weyland Mountains. Samples of upland birds available for comparison from the Fakfak and Kumawa Mountains comprise small series of eight species collected by Doherty and discussed by Rothschild & Hartert (1901–15), mist-netted birds from North and South Kumawa examined by JD and released, the few prepared as study skins, JD's & KDB's notes on birds observed in the field, and KDB's field photographs of a few species, in Central Kumawa. These comparisons yield the following conclusions.

Based on current information, Fakfak and Kumawa populations of 17 species are recognisably distinct, of which three have already been described as endemic subspecies (Diamond 1985) and the other 14 are unnamed (see Future studies). Of these 17 species with distinct populations, it is apparent that those of Tropical Scrubwren *Sericornis beccarii* and *Heteromyias albispecularis* are more similar to Vogelkop birds than to Weyland birds (and also to Wandammen birds in the case of the former; the latter is absent from Wandammen).

Only some of the remaining species are zoogeographically informative, for either or both of two reasons: Vogelkop, Wandammen and Weyland populations lack recognisable differences, and / or collected specimens are not available for the Fakfak / Kumawa populations or distinctive subspecific characters were not apparent in the field. Those species that did prove informative were as follows.

In four cases (*Rallicula leucospila*, *Amblyornis inornatus*, Vogelkop Scrubwren *Sericornis rufescens* and Vogelkop Melidectes *Melidectes leucostephes*) the Vogelkop and Weyland populations belong to different allospecies of the same superspecies. In each case the Fakfak and / or Kumawa populations belong to the Vogelkop allospecies, not the Weyland allospecies. Only the first two of these four species are present in Wandammen, both involving the same allospecies as in the Vogelkop.

In two cases (*Tregellasia leucops* and *Diphyllodes magnificus*) the Fakfak and / or Kumawa population belongs to the same subspecies as on the Vogelkop and differs from the Wandammen and Weyland subspecies. *Zosterops novaeguineae* is shared between Fakfak / Kumawa and the Vogelkop, but is absent from Wandammen and Weyland. Finally, the

Fakfak and Kumawa populations of *Ptilinopus oruatus* belong not to the purple-capped race *P. o. oruatus* of the Vogelkop, but to the yellow-capped race *P. o. gestroi* of the Central Range, known from the Snow Mountains eastwards, but not collected in the Weylands.

Thus, of ten zoogeographically informative cases, in nine the Fakfak and Kumawa populations are more similar to those of the Vogelkop (plus in four cases more similar to the Wandammen population) than to Central Range birds from the Weyland Mountains, while in one the closer relationship is with the Central Range. One possible explanation is that the Fakfaks are closer today to the Arfaks than to the Weylands (190 km vs. 260 km, respectively). But this modest difference appears inadequate to explain the preponderance of Arfak affinities. In addition, the straight-line distance comparison is complicated by the differing contributions of flat lowlands, shallow seas and low mountains (1,500 m) to the Arfak and Weyland routes. Therefore, we consider the explanation for the large preponderance of Arfak affinities to be an unresolved question.

### Mixed-species foraging flocks

Itinerant mixed-species foraging flocks are conspicuous in New Guinea, as in other parts of the world. Three types of such flocks occur in New Guinea at elevations below 1,525 m (Bell 1983, Diamond 1987b). One, termed the flycatcher / warbler flock, comprises passerines that are insectivorous, small (body mass 7–25 g), often yellowish and / or greenish, and forage in the lower storey and midstorey at 3–9 m. A second flock, termed the brown and black flock, consists of passerine species that are omnivorous, medium-large (50–140 g), brown and / or black, and its members variously forage from the lower storey to the canopy. The third flock, termed the bird wave, combines the first two flocks into a large wave containing dozens of species and up to 100 individuals, and includes a few non-passerines.

All three types of flocks occurred on all four transects. Flocks were commonest in Fakfak and North Kumawa, less common in South Kumawa, and least common and smallest in Central Kumawa. These differences may have resulted partly from altitude, because our observations on the South Kumawa and Central Kumawa transects were mainly at higher altitudes, where flocks are less common. Seasonal differences may also have been a factor, because our four surveys were at different times of year.

The following initial comments are generalisations based on all four transects, to be followed by separate comments for each transect. Each flock has one or more nuclear species, which are the noisiest and most numerous taxa, and lead the flock, with other species following behind. Leaders of the flycatcher / warbler flocks consist (depending on locality) of *Sericornis*, *Gerygone* and *Phylloscopus* warblers, *Rhipidura*, *Monarchia* and *Symphysichrus* flycatchers, and *Pachycephala* whistlers. They may also include *Machaerirhynchus* and *Microeca* flycatchers and the warbler-like Green-backed Honeyeater *Glycichaera fallax*. Each species is represented in the flock by up to three individuals, usually one or two.

Brown and black flocks have four main components. They are led by Papuan Babbler *Garritornis isidorei* at low elevation, plus species of pitohuis whose identity varies with altitude (mainly Rusty Pitohui *Pseudorectes ferrugineus*, Northern Variable Pitohui *Pitohui kirhocephalus* and *P. dichrous*, locally White-bellied Pitohui *Pseudorectes incertus* elsewhere in New Guinea, and occasionally Black Pitohui *Melanorectes uigrescens* and Piping Bellbird *Ornorectes cristatus*). A second component is Spangled Drongo *Dicrurus bracteatus* at low elevations and Pygmy Drongo *Chaetorhynchus papueusis* at higher altitudes. A third component is birds of paradise of 15 different species, with up to four species in a given flock. The fourth component is *Coracina* and *Edolisoma* cuckooshrikes of seven different species, with up to three species in a given flock. Brown and black mixed flocks also include

honeyeaters and Little Shrike-Thrush *Colluricincla megarhyncha*. One of the honeyeaters, the rare Tawny Straightbill *Timeliopsis griseigula*, is encountered almost solely in brown and black flocks, which may also be true of *Pseudorectes incertus*. The babbler and pitohuis forage at any height from the understory to the canopy, while the birds of paradise and cuckooshrikes remain in the crown. Unlike flycatcher / warbler flocks, in which only a few individuals represent each species, the leaders of the brown and black flocks are regularly represented by up to eight individuals.

As their name implies, all species in the brown and black flocks are various shades of brown and / or black. Some are entirely black (the two drongo species, three species of birds of paradise in the genera *Manucodia* and *Phonygammus*, and males of several of the other birds of paradise species, plus Black Cicadabird *Edolisoma melas* and *Melanorectes nigrescens*). Some species are wholly or almost entirely brown (*Garritornis isidorei*, four pitohuis, two honeyeaters, *Colluricincla megarhyncha*, two birds of paradise, and females of nine birds of paradise and *Edolisoma* species). In addition to being confusingly similar in appearance, several flock members mimic each other's calls. The discovery that several of the leader pitohui species are poisonous suggests a driving force for the evolution of visual and vocal mimicry (Dumbacher *et al.* 1992, 2008).

We now comment on the flocks separately for each of the four transects. In Fakfak, where flocks were common, the leaders of brown and black flocks changed with altitude: *Garritornis isidorei*, *Pseudorectes ferrugineus* and *Pitohui kirhocephalus* below 300 m, *Pseudorectes ferrugineus*, *Pitohui kirhocephalus* and *P. dichrous* at 690–785 m, and *P. dichrous* alone at higher altitudes. Birds of paradise were *Diphyllodes magnificus* and Magnificent Riflebird *Ptiloris magnificus* females, plus *Phonygammus keraudrenii* and Crinkle-collared Manucode *Manucodia chalybatus*. Cuckooshrike members were *Edolisoma melas*, Grey-headed Cicadabird *E. schisticeps*, *E. incertum* and Stout-billed Cuckooshrike *Coracina caeruleogrisea*. For flycatcher / warbler flocks at 690–789 m, the nuclear species were Yellow-bellied Gerygone *Gerygone chrysogaster*, Chestnut-bellied Fantail *Rhipidura hyperythra* and Frilled Monarch *Arses telescopthalmus*, plus *Phylloscopus poliocephalus*, *Gerygone palpebrosa*, Northern Fantail *Rhipidura rufiventris*, Rufous-backed Fantail *R. rufidorsa*, Spot-winged Monarch *Symposiachrus guttula*, Black-winged Monarch *Monarcha frater*, Golden Monarch *Carterornis chrysomela*, *Pachycare flavogrisea* and Grey Whistler *Pachycephala simplex*.

In North Kumawa, where flocks were also common, leadership of the brown and black flocks changed with altitude in the same succession as in Fakfak. Lesser Bird of Paradise *Paradisaea minor* (both sexes) joined brown and black flocks in North Kumawa but not in Fakfak. Both of our only observations of the rare *Timeliopsis griseigula* in North Kumawa were in brown and black flocks, as was Rheindt's only observation in Fakfak.

In South Kumawa, where JD observed fewer mixed flocks, changes with altitude were striking. At low elevation the brown and black flocks were led by *Pitohui kirhocephalus* and *Pseudorectes ferrugineus*, followed by *Dicrurus bracteatus*, while flycatcher / warbler flocks were led by *Gerygone chrysogaster*, *Rhipidura rufidorsa*, *R. hyperythra*, *Arses telescopthalmus*, Yellow-breasted Boatbill *Machaerirhynchus flaviventer* and *Pachycephala simplex*, and joined by *Rhipidura rufiventris* and *Symposiachrus guttula*. At 1,055 m, leaders of flycatcher / warbler flocks were *Sericornis rufescens*, *S. beccarii*, *Symposiarchus axillaris* and *Pachycephala soror*, joined by *Monarcha frater*. Above 1,400 m the nuclear species was Regent Whistler *P. schlegelii*, which several times per minute gave songs shorter and weaker than full dawn songs; other vocalists were *Sericornis rufescens*, *Rhipidura albolimbata* and Black Fantail *R. atra*. There were no brown and black flocks at such high altitudes, because the last potential leader, *Pitohui dichrous*, reached its altitudinal ceiling at 1,260 m, and the high-altitude pitohui *Melanorectes nigrescens* joins flocks only infrequently.



Finally, in Central Kumawa the brown and black flocks at 1,026–1,210 m were few and small, led by *Pitohui dichrous* and joined by *Pseudorectes ferrugineus*, *Ptiloris magnificus*, *Edolisoma montanum* and *Pachycephala soror*. Flycatcher / warbler flocks were more frequent and included three *Sericornis* species (*S. beccarii*, *S. virgatus*, *S. spilodera*), *Phylloscopus poliocephalus*, *Rhipidura albolimbata*, *Pachycephala soror*, *Chaetorhynchus papuensis* and Spectacled Longbill *Oedistoma ilioplus*. A single large bird wave included most of the flycatchers and warblers, plus several brown and black flock members (*Pitohui dichrous*, Black-billed Sicklebill *Drepanornis albertisi* and female *Diphyllodes magnificus*), plus Mid-mountain Berrypecker *Melanocharis longicauda*.

## Local names

Ornithologists conducting field work in New Guinea find it of enormous value to learn local language names for individual bird species. With those names, visiting ornithologists can ask local guides to point out particular species and identify songs, and can tap into the encyclopedic knowledge of bird habits and life histories that New Guineans have accumulated. Approximately 1,000 different local languages are spoken in New Guinea, each with its own set of bird names.

Column 5 of the Appendix provides local names for bird species in two forms of the Baham language: as spoken in the Fakfaks, and as spoken at Nusawulan village at the base of the Kumawas. Emigrants from Fakfak founded Nusawulan about three generations before JD was given those names by local informants in 1983. Comparison of the two lists reveals that, of 28 species for which names are available in both dialects, 21 names are the same or very similar, while seven are different, perhaps because they have changed in the course of three generations. When Doherty was collecting in the Fakfak area in 1896, he recorded one local bird name, 'lusi', for White-bellied Sea-Eagle *Haliaeetus leucogaster* (Rothschild & Hartert 1901: 57); JD was given the same name for that eagle in 1983.

As the Appendix demonstrates, most local names refer to a single species. However, in seven cases the same name refers to two or more similar species that Western ornithologists also find difficult to distinguish: 'sikeké' is used for four waders, 'kananáwa' for three terns, 'wihía' for two *Ptilinopus* fruit-doves, 'uriyási' for three *Coracina* cuckooshrikes, 'sisi' for four small passerines (two *Sericornis* and two sunbird species), 'sihánut' for two *Rhipidura* fantails and 'wasisi' for two pitohui species. Less obviously, 'sororo' refers to both the black Shining Flycatcher *Myiagra alecto* and Banded Yellow Robin *Gennaeodryas placens*, because Baham informants found the nasal calls of these two species as confusingly similar in the field as did JD. The name 'totókweras' is applied by Nusawulan villagers both to the brownish *Pitohui kirhocephalus* of hill forests and the olive, grey and whitish Varied Honeyeater *Gavicalis versicolor* on offshore small islands—not because villagers are in any doubt about the distinctness of the two species, but because both have loud bubbly songs.

As for etymologies of the names, a few are onomatopoeitic renditions of the bird's vocalisation, such as 'kuwók-kuwók' for Brown Cuckoo-Dove *Macropygia amboinensis* and 'kowok' for Helmeted Friarbird *Philemon buceroides*. However, most names do not have obvious etymologies that we can recognise.

The Appendix also provides six and 75 unidentified Baham names that informants at Nusawulan and in the Fakfak area, respectively, provided to JD. These names were applied to birds that the informants described, or to unidentified vocalisations heard in the field. They may help future observers to be guided in the field to some species that we did not succeed in observing ourselves.

## Future studies

We conclude by calling attention to four sets of problems whose resolution will require more field work in the Fakfaks and Kumawas. First, there are at least 14 species of which Fakfak and / or Kumawa populations are evidently morphologically distinct but have not been named. Preliminary diagnoses based on field observations, photographs (Figs. 3–7) or mist-netted individuals are provided herein or by Diamond (1985). Collection of specimens (or of more specimens) is required before they can be assessed and described. Most distinct is the Fakfak and Kumawa population of, or related to, *Melanocharis longicauda*, diagnosed below. The others (Fakfak and Kumawa populations, respectively, abbreviated F and K in parentheses) are *Rallicula leucospila* (K: Fig. 3), *Amalocichla incerta* (K), Chestnut-backed Jewel-Babbler *Ptilorrhoa castanonota* (F, K: Fig. 6), *Crateroscelis robusta* (F, K: Fig. 5), *Sericornis beccarii* (F, K), *Heteromyias albispecularis* (K: Fig. 7), *Pachycephala schlegelii* (F, K), *P. soror* (F), *Drepanornis albertisi* (F, K), *Melidectes leucostephes* (F, K), Mountain Meliphaga *Meliphaga orientalis* (F, K), *Ptiloprora erythroleura* (F, K) and *Zosterops novaeguineae* (K).

Second, of the three populations of Kumawa birds already described as endemic subspecies (Diamond 1985), two pose uncertainties as to their true taxonomic assignment. The Kumawa population of the common mid-elevation whistler has been named *Pachycephala soror octogenarii*, but it is so distinctive compared to other populations of *P. soror* that its status as a separate species should be reconsidered. The whistler's Fakfak population, still uncollected, appeared in the field to be not identical to the Fakfak birds (see below). *Melipotes* honeyeaters are currently considered a superspecies with four allospecies (Common Smoky Honeyeater *M. fumigatus* of the Central Range and two outliers, Western Smoky Honeyeater *M. gymnops* of the Arfak, Tamrau and Wandammen outliers, Spangled Honeyeater *M. ater* of the Huon outlier, and Wattled Smoky Honeyeater *M. carolae* of the Foja outlier). The Kumawa population of the distinctive *Melipotes* populations of Fakfak and Kumawa, collected in 1983, was named *M. fumigatus kumawa* based on two specimens. However, field observations and photographs (see Fig. 4) that we made in Central Kumawa in 2013 suggest that the population is more distinctive in its face wattles and plumage than previously appreciated, and approaches *M. gymnops* and *M. carolae* in some characters, so that its species allocation is now uncertain.

Third, the identification of seven populations or pairs of populations observed in the field is uncertain: the mountain cassowaries of both Fakfak and Kumawa (Dwarf Cassowary *Casuarus bennetti* or lowland Southern Cassowary *C. casuarus*?), the *Talegalla* allospecies of Fakfak and Kumawa (Yellow-legged Brushturkey *T. fuscirostris* or Red-billed Brushturkey *T. cuvieri*?), the marsh crake of Central Kumawa's Marsh Camp, the Fakfak *Sericornis* identified in the field as *S. arfakianus* (but perhaps *S. rufescens* as in Kumawa?), the Fakfak *Peneothello* population that Gibbs (1994) identified as Blue-grey Robin *P. cyanus* (but possibly *P. cryptoleuca* as in Kumawa?), the two Fakfak birds that Gibbs identified as being the bird of paradise genus *Paradigalla* (which would be surprising), and the Fakfak berrypecker identified as *Melanocharis striativentris* (but perhaps female *M. longicauda*?).

Finally, Tables 1–2 list upland species not yet recorded in one or both Fakfak and Kumawa, but which might be considered plausible candidates to be present, based on their overall geographic and altitudinal ranges. Which really are absent and which are present but have so far been overlooked? Of these absentees, those that we consider most likely to be present are (Table 1) *Alopecoenas beccarii*, *Aegotheles albertisi*, *A. insignis*, *Coracina lineata*, *Zoothera heinei* and *Zosterops novaeguineae* in the Fakfaks; (Table 1) *Myzomela cruentata* and *Xanthotis polygrammus* in the Kumawas; and (Table 2) *Aegotheles wallacii*, *Monachella muelleriana* and *Grallina bruijnii* in both ranges.

## Species accounts

### **CASSOWARIES** *Casuarius* sp.

We frequently saw piles of cassowary droppings and occasionally heard cassowaries up to between 915 m and 1,250 m in both ranges. Two brief sightings, plus descriptions by local people, were insufficient to identify if our observations referred to just one or both of the two regional cassowaries (Southern *C. casuarius* and Dwarf Cassowaries *C. bennetti*). Gibbs and Rheindt both identified only the former.

### **WATTLED BRUSHTURKEY** *Aepypodius arfakianus*

A total of eight mounds, one containing > 20 rotting eggs, at higher elevations in both ranges.

### **BRUSHTURKEYS** *Talegalla* sp.

We heard upslurred and constant-pitch *Talegalla* calls on three of our four transects. Calls that JD heard in Fakfak resembled a donkey's braying in quality and differed from calls of Fly River Yellow-legged Brushturkey *T. fuscirostris* and north-coast Red-legged Brushturkey *T. jobiensis* with which JD is familiar, suggesting they belonged to *T. cuvieri*. However, Rheindt identified one *Talegalla* that he saw in Fakfak as *T. fuscirostris* based on soft-part colours. Kumawa calls were hoarse upslurred honks similar to calls of *T. fuscirostris* and *T. jobiensis*. The only individual that we saw, in Kumawa, had yellow legs and a grey rather than yellowish-olive bare face, also suggesting *T. fuscirostris* rather than *T. cuvieri*. Thus, there remains uncertainty as to the *Talegalla* species involved.

### **PACIFIC BLACK DUCK** *Anas superciliosa*

Up to 32 around the pond at Kumawa Marsh Camp. Numbers increased when the pond level rose after rains. Also observed by R. Sneider at another nearby marsh that he visited by helicopter.

### **TRICOLOURED GREBE** *Tachybaptus tricolor*

One or two in breeding plumage on the pond at Kumawa Marsh Camp on three days.

### **MEYER'S GOSHAWK** *Accipiter cf. meyerianus*

We once saw a notably large, slender-tailed accipiter, presumably this species, soaring over Kumawa Marsh Camp.

### **GURNEY'S EAGLE** *Aquila gurneyi*

One adult displaying and then hunting over forest surrounding Kumawa Marsh Camp.

### **WHITE-STRIPED FOREST-RAIL** *Rallacula lencospila*

This little-known rail had previously been recorded only from the Tamrau, Arfak and Wandammen Mountains, north of Fakfak. Its discovery to the south in Kumawa, but not in the intervening Fakfaks, and the identification of its remarkable call, were among our most interesting results (Fig. 3). Frequently heard and seen from c.1,020 m up to the highest elevations on both of our upper Kumawa transects, but neither heard nor seen in Fakfak. Walking on the forest floor as male/female pairs, or singles, or two separated individuals counter-singing. The presumed male is deep chestnut-red over the entire body, but the back and wings are black with fine whitish streaks. The presumed female is similar but



has indistinct barring on the tail and posterior flanks. Bill and legs are dark. The Kumawa population appears to differ from the nominate Vogelkop race in the male's unbarred tail. Of the three vocalisations, the simplest is a single, quiet, short, pig-like grunt. The second vocalisation, which we did not prove belongs to this species, is a series of 5–12 loud short grunts at intervals of 1.0–1.5 seconds, all on the same pitch, but with a distinctive change in quality as it proceeds (initially frog-like, then progressively hoarser and more like a dog's bark). For the longest and most remarkable call, our Papuan colleagues and JD were initially uncertain whether it was made by a distant large beast or a nearby frog, snake or marsupial. The quality suggests a frog or an unpleasant electronic device, rather than a bird. It commences with a long, fast, ascending, accelerating series of notes, concluding in many rapid sets of notes of which the first note of each set is two whole tones lower in pitch, followed by 2–5 identical notes at the upper pitch, with unpredictable variation between them. One bird, not a duetting pair, gives the entire call. Singers approached us in response to playback.

### **CRAKE**

Once KDB briefly saw a small black crane flutter across a stream in the marsh at Kumawa Marsh Camp. It could have been a juvenile of any of several species. Habitat makes *Rallacula leucospila* unlikely.

### **ORNATE FRUIT-DOVE** *Ptilinopus ornatus*

One of only three species (the others were Large Scrubwren *Sericornis nouhuysi* and Josephine's Lorikeet *Charmosyna josefinae*) that we found confined to the highest Kumawa elevations above 1,500 m. But Doherty, Gibbs and Rheindt all found it at lower elevations in Fakfak, as throughout New Guinea it breeds at higher elevations then moves in post-breeding flocks to lower elevations. Like those Fakfak birds observed or collected by others, Kumawa birds belong to the widespread yellow-capped race *P. o. gestroi* rather than to the purple-capped Vogelkop race *P. o. ornatus*.

### **CORONETED FRUIT-DOVE** *Ptilinopus coronulatus*

In both Fakfak and Kumawa. Like many other *Ptilinopus*, its call is a series of *hoo* notes that at first rises slightly and then descends in pitch. However, the *hoo* series of *P. coronulatus* is easily distinguished because it accelerates greatly (more than in any other *Ptilinopus* known to us) and is high-pitched.

### **CLARET-BREASTED FRUIT-DOVE** *Ptilinopus viridis*

A common montane species in both Fakfak and Kumawa, absent from the lowlands. It has a curious distribution on the New Guinea mainland: the species is unknown in the Central Range but occurs on all outlying ranges proceeding counterclockwise along the coast from the easternmost peak of the North Coastal Range (Prince Alexander Mountains) west to the Vogelkop and south to the Fakfaks and Kumawas. The sole possible exception is an 1828 record by S. Müller from Lobo on Triton Bay, just east of the Kumawas.

### **ELEGANT IMPERIAL PIGEON** *Ducula concinna*

The sole New Guinea mainland records of this supertramp (small-island specialist) are several individuals that JD observed on the south coast of the Kumawas in September 1983 (Diamond 1985).

**LORIKEETS** *Charmosyna* spp.

We identified both *C. josefinae* and Little Red Lorikeet *C. pulchella* in Fakfak and Kumawa. In both ranges we also heard and saw small lorikeets, either Red-flanked Lorikeet *C. placentis* and / or the very similar Red-fronted Lorikeet *C. rubronotata*, which we succeeded in identifying only once: *C. placentis* at 635 m in Fakfak. It remains an open question whether *C. rubronotata* also occurs in Fakfak, and which (or both) of these two small lorikeets occurs in Kumawa.

**LARGE FIG-PARROT** *Psittaculirostris desmarestii*

Calls similar to those of the closely related Salvadori's Fig-Parrot *P. salvadorii*, and stronger than those of the small *Charmosyna* lorikeets were heard: sucked-in and squeaky, reminiscent of the sound of a triphammer, with a sharp start and sharp finish (i.e., staccato).

**RED-BREASTED PYGMY PARROT** *Micropsitta bruijnii*

Notably common in Central Kumawa, where we located six active nests each attended by an adult male and adult female, and in some cases 1–2 immatures. Nests were holes 2–3 m above ground in standing and rotting trees, three nests each near Top Camp and near Marsh Camp. We once encountered a flock of 10–20 foraging in the lower canopy.

**RED-CHEEKED PARROT** *Geoffroyus geoffroyi*

Throughout New Guinea this species' call consists of a loud ringing series of equal-spaced notes on the same pitch, with a metallic quality like a hammer striking an anvil. The Kumawa dialect is distinctive in that the series decelerates markedly and descends slightly in pitch.

**MOLUCCAN KING-PARROT** *Alisterus amboinensis*

This species of far-western New Guinea and the Moluccas has three quite different calls. (1) A series of 4–12 piercing and very high-pitched upslurs at a rate of one per second; the whole series descends, or the first note is at a lower pitch than the second, or the first three notes descend, then the fourth note returns to the same pitch as the first, before the series descends again. (2) A loud nasal note, much like the sound of someone striking wood with an axe. (3) A fairly loud, short, staccato, unmusical note with the quality of two sticks being rubbed together. The related Papuan King-Parrot *A. chloropterus* of central and east New Guinea utters calls very similar to the first two of these, but we have not heard it give a call similar to the third.

**RUFIOUS-THROATED BRONZE CUCKOO** *Chalcites ruficollis*

On the mornings of 26 March and 27 March 2013 at our Kumawa Marsh Camp (1,026 m), KDB saw well and tape-recorded a pair foraging in the forest canopy. This observation was surprising, because the species is known elsewhere from above 1,280 m, mainly above 1,800 m, whereas the common New Guinea *Chalcites* at 1,000 m is *C. meyeri*; JD saw and heard White-eared Bronze Cuckoo *C. meyerii* at or near this elevation on his North and South Kumawa transects in 1983, and Doherty and Gibbs, respectively, collected and saw *C. meyerii* in the Fakfaks. However, there is no doubt that KDB's observation involved *C. ruficollis*, as the pair had the chin, throat and breast very rich rufous or russet (rather than clean white as in *C. meyerii*) and well-marked bars on the white belly posterior to the rufous. His tape-recordings involve a series of eight identical, very high-pitched, somewhat drawn-out notes, rather than short downslurs, delivered at the rate of 1.6 notes per second, with no change in pitch and rate over the series. KDB's recording agrees with S. Connop's of the

song of *C. ruficollis*. The song of *C. meyerii*, which we have often heard elsewhere, differs in being lower pitched, slower (one note per second), with a distinctive deceleration and drop in pitch over the last two notes. We did not hear or see *C. meyerii* at Marsh Camp.

#### **OWLET-NIGHTJARS** *Aegotheles* spp.

On five nights at our Kumawa Marsh Camp we heard the unmistakable hoarse three-note ascending call of Feline Owlet-Nightjar *A. insignis*. JD mist-netted a Mountain Owlet-Nightjar *A. albertisi* at his highest camp (1,390 m) in South Kumawa (Diamond 1985). On six nights at our Kumawa Top Camp and Marsh Camp, we heard the presumed call of *A. albertisi*: a soft, staccato, slightly upslurred, medium to high-pitched note, repeated *ad nauseam* at the rate of one note per second, with a quality resembling a small dog or Sugar Glider *Petaurus breviceps*. At 180 m in forest in North Kumawa, JD observed a dull grey-brown aegothelid day-roosting on a branch; he noted fine white spots on the back and wings, 8–12 narrow white bands on the tail and no collar, characteristics compatible with either Wallace's *A. wallacii* or Barred Owlet-Nightjars *A. bennettii*, but not with *A. insignis* or *A. albertisi*.

#### **MOUNTAIN SWIFTLET** *Aerodramus hirundinaceus*

One mist-netted (feathered upper tarsus) at 1097 m in South Kumawa. In Fakfak the brown swiftlets at high elevations had whitish underparts, while those at low elevation over Fakfak town had brownish underparts, suggesting that the former were *A. hirundinaceus* and the latter were Uniform Swiftlet *A. vanikorensis*.

#### **VOGELKOP BOWERBIRD** *Amblyornis inornata*

The three previously known populations of this bowerbird, in the Arfak, Tamrau and Wandammen Mountains, are famous for their bowers of stick 'huts' up to 2 m in diameter and 1.5 m tall, extensively decorated with fruits, flowers, fungi, butterfly wings, beetle elytrae, sticks, stones, leaves, acorns, eggshells and resins (in red, pink, orange, yellow, green, blue, purple, black, brown, grey and white) (Gilliard 1969, Frith & Frith 2004). The Fakfak bowers reported to JD by natives in 1981 and subsequently observed by Gibbs (1994), Uy & Borgia (2000) and Rheindt (2012), and the Kumawa bowers that JD discovered in 1981 (Diamond 1985, 1986, 1987a, 1988), differ drastically in comprising a tower of sticks up to 2.4 m tall, standing on a black moss platform up to 1.8 m in diameter, and (with one exception mentioned below) decorated only with black, white, grey and brown objects. Because of these large differences in bower style, Gibbs (1994) concluded that the Fakfak / Kumawa populations could not be conspecific with Arfak / Tamrau / Wandammen populations. However, the two populations are nearly identical morphologically (Diamond 1985) and differ genetically by only 0.5% (Uy & Borgia 2000). Bower-building by male bowerbirds, and mate selection on the basis of bower design by female bowerbirds, appear to be cultural traits involving learning in both sexes (Diamond 1986).

Our 2013 observations extend this conclusion by adding evidence of geographic variation in bower style over small distances within the same range. Bowlers that F. Sadsuitubun observed in Kumawa in 1975, c.8 km by air from JD's 1983 South Kumawa transect, differed from the latter bowlers in being decorated with fruits of four colours, much more often decorated with white stones, and having dark stones scattered over the mat rather than assembled in a pile (Diamond 1987a). The eight bowers that JD & KDB observed in their 2013 Central Kumawa transect between 1,026 and 1,654 m, c.11 km from JD's South Kumawa transect, differed in that two were decorated with a neatly rectangular row, 1.2 m long by 13 cm wide, of 5-cm pieces of buff-colored clay (Fig. 2). These eight bowers



consisted of 1–2 towers of sticks up to 1.5 m tall, glued together with an unidentified white substance around a sapling, on a circular moss mat 0.9–2.1 m in diameter. Decorations besides the clay rectangle were *Pandanus* leaves propped against the stick tower, pale snail shells, black beetle elytrae, grey or buff stones, long thin black sticks, whitish limestone and black palm seeds. Gilliard (1969) and Gilliard & LeCroy (1970) previously noted wide individual variation in Tamrau bowers, similar to our observation of individual variation in the presence or absence of a clay rectangle in Central Kumawa bowers.

As had Diamond (1986, 1988) in South Kumawa and Wandammen, and Uy & Borgia (2000) in Fakfak and Arfak, JD & KDB in 2013 in Central Kumawa placed coloured poker chips at bowers to test whether the absence of coloured natural decorations at Central Kumawa bowers reflects a lack of available natural objects in the environment, or instead the birds' preferences. Confirming the latter interpretation, when we placed poker chips on two of the bowers—chips uniformly coloured red, orange, yellow, blue, purple or violet, and green, blue or black chips with white spots—most or all of them disappeared, presumably discarded by the bower-owner. Similarly, South Kumawa bower-owners, which do not use coloured natural decorations, discarded coloured poker chips placed at their bowers, while Wandammen bower-owners, which do use coloured natural decorations, used coloured poker chips placed nearby to decorate their bowers (see Fig. 2 in Diamond 1986).

#### **BROAD-BILLED FAIRYWREN** *Chenorhamphus grayi*

Our only records of this very uncommon, sparsely distributed species were two observations in North Kumawa (Le Croy & Diamond 1995).

#### **WHITE-SHOULDERED FAIRYWREN** *Malurus alboscapulatus*

The sole known population in Fakfak and Kumawa was in the marsh grass at our Kumawa Marsh Camp, where it was by far the most abundant species, usually in groups of up to four. Populations fall into three groups, of which two have checkerboard distributions (Rand & Gilliard 1967). The Kumawa population belongs to the first of the three groups (races *aida*, *moretoni* and *randi*, from the north-west New Guinea lowlands, south-east lowlands and Wissel Lake, respectively) in being sexually monomorphic (all presumed adults black with white scapular patches). Presumed young birds (occasional individuals begging) were brownish black rather than black, with a white throat and variable blotchy white on the rest of the underparts.

#### **RUFIOUS-SIDED HONEYEATER** *Ptiloprora erythropleura*

Abundant at high elevations in both Fakfak and Kumawa, mainly in the midstorey and lower canopy, and frequenting flowering trees. Fakfak and Kumawa birds resemble *P. e. dammermanni* of the Central Range in the green irides (red in nominate *P. e. erythropleura* of Arfak and Tamrau) but differ in the yellow-olive ventral wash. The flanks were rufous in some but apparently not all individuals we saw, and not in Fakfak birds observed by Gibbs. The high-pitched plaintive call, monotonously repeated every 3–6 seconds, is usually a single slurred note (upslurred, or downslurred, or slurred up then down, or vice versa) as in other *Ptiloprora* species. But some calls, unusually for the genus *Ptiloprora*, had a two-note or three-note pattern, and were high, plaintive and monotonously repeated.

#### **SMOKY HONEYEATERS** *Melipotes* sp.

In Fakfak seen three times by JD, seen by Gibbs, and briefly observed once by Rheindt. In South Kumawa JD saw eight individuals and mist-netted four, of which two were collected and described as *M. fumigatus kumawa* (Diamond 1985). In Central Kumawa JD & KDB saw

it daily at Top Camp, where KDB photographed one (Fig. 4). Always solitary and silent, foraging from the lower storey to the canopy, in flowering trees, and eating catkins and insects on leaves.

Populations of the upland genus *Melipotes* are currently divided into four allospecies: Common Smoky Honeyeater *M. fumigatus* of the Central Range and two outlying ranges (Cyclops and North Coastal Range), and three allospecies confined to outlying ranges in the northern watershed (Wattled Smoky Honeyeater *M. carolae* of the Foja Mountains, Western Smoky Honeyeater *M. gymmops* of Arfak, Tamrau and Wandammen, and the sociable, noisy, much larger Spangled Honeyeater *M. ater* of the Huon Peninsula). In plumage *M. f. kumawa* is closer to the widespread *M. f. fumigatus* than to *M. gymmops* or *M. ater*. *M. f. kumawa* differs from *M. f. fumigatus* in the alternating blackish and white, bold curved marks on the lower breast and belly, the white rather than indistinctly grey-tipped upperwing-coverts, the more extensive and whiter pale area on the underwing linings, and the blackish rather than pale grey chin and throat. In life the head wattles are yellow or deep yellow tending to orange, and are divided on each side into a face wattle and almost separate throat wattle obvious in Fig. 4. In wattle form Kumawa birds resemble *M. carolae* of the Foja Mountains (compare Fig. 2a in Beehler *et al.* 2007), which also approaches or resembles *M. f. kumawa* in its dark throat but differs in its deep red-orange wattles. More specimens are required to clarify relationships between Fakfak, Kumawa and Foja *Melipotes*, and to clarify species limits within the genus *Melipotes*.

#### **TAWNY STRAIGHTBILL** *Timeliopsis griseigula*

This rare honeyeater was observed twice by JD in North Kumawa (1985) and once by Rheindt in Fakfak. All three observations were within mixed-species flocks of brown and black birds, including several almost uniformly brown species very similar to *T. griseigula*, which is best distinguished by its hyper-nervous behaviour involving rapid movements with few and brief pauses, flaring its tail, and hanging upside-down to probe leaves.

#### **VOGELKOP MELIDECTES** *Melidectes leucostephes*

At higher elevations in Fakfak and Kumawa; previously known only from Arfak and Tamrau. In life Kumawa birds have the bare facial skin bluish white, the small throat wattles red and the bill pale. We found the Kumawa population uncommon, compared to the abundance of most other *Melidectes* species in other ranges. Vocalisations included some typical loud *Melidectes* calls, especially a series of short, medium-high, harsh or nasal upslurred or downslurred caws given at a rate of three per second. A distinctive call heard only at dusk is a rapid stereotyped series of four downslurs, the first on a lower pitch, the second and third higher, and fourth at middle pitch. Even more distinctive is a loud stereotyped duet: one individual gives a rapid series of seven notes, the first upslurred, the next six distributed over three lower pitches, while the other individual utters small clucks and a staccato series of identical pairs of notes, the second note of each pair louder and longer, and at a lower pitch than the first note.

#### **WHITE-EARED MELIPHAGA** *Meliphaga montana*

A shy forest interior species of the lower canopy at heights of 5–12 m, alone or in pairs, often joining mixed flocks. Readily distinguished from other meliphagas by two features: its call, a short upslurred *wheep*, and its loud wingbeats. Plumage is dull and dark, the underparts obscurely spotted, the rictal streak white, and the ear-coverts white in adults and soiled pale yellowish in immatures. In Fakfak Rheindt saw two and Doherty collected one.





Figure 3. White-striped Forest-Rail *Rallidula leucospila*, Kumawa Mountains, New Guinea, March 2013 (K. D. Bishop)

Figure 4. Common Smoky Honeyeater *Melipotes* cf. *fumigatus kumawa*, Kumawa Mountains, New Guinea, March 2013 (K. D. Bishop)

Figure 5. Mountain Mouse-Warbler *Crateroscelis robusta*, Kumawa Mountains, New Guinea, March 2013 (K. D. Bishop)

Figure 6. Chestnut-backed Jewel-babbler *Ptilorrhoa castanonota*, Kumawa Mountains, New Guinea, March 2013 (K. D. Bishop)

Figure 7. Ashy Robin *Heteromyias albispecularis*, Kumawa Mountains, New Guinea, March 2013 (K. D. Bishop)

### MOUNTAIN MELIPHAGA *Meliphaga orientalis*

Abundant in Fakfak and Kumawa above the altitudinal ranges of all closely related species of *Meliphaga*. Compared to other populations of *M. orientalis*, Fakfak and Kumawa birds are large-bodied, the yellow ear patch is small, and the ventral streaks or spots obscure. There are three calls, of which the first two enable one (with practice) to distinguish this species



from its very similar low-elevation relative Mimic Meliphaga *M. analoga*: a snapped, short, upslurred or downslurred disyllable (*M. analoga*'s disyllables are much louder and lack the snapped quality); a short, musical *tp* contrasting with the strong staccato *tp* note of *M. analoga*; and a piping, querulous, fussing series of *c.*7 notes, the first one on a lower pitch. In addition to *M. albonotata*, *M. montana* and *M. orientalis*, the other species in the *M. analoga* complex that we observed were *M. analoga* at low elevations with a single observation of Puff-backed Meliphaga *M. aruensis* in Fakfak, while Rheindt observed Yellow-gaped Meliphaga *M. flavirictus* in a fruiting tree in Fakfak.

#### **SCRUB MELIPHAGA** *Meliphaga albonotata*

Two individuals on two different days in 6 m-tall second growth within 30 m of the beach in North Kumawa gave two of this species' calls: a bright downslurred disyllable repeated three times, and a staccato note *tp*. In Fakfak Rheindt observed one and Doherty collected one.

#### **GOLDENFACE** *Pachycare flavogriseum*

Abundant at 787–1,209 m, and giving fragmentary songs, on JD's Fakfak transect, but not encountered by Gibbs or Rheindt. The underparts of the Fakfak population are yellow in life, and not at all orange as are the populations of the Foja Mountains and the western Central Range, whose orange colour gradually fades to yellow with time in specimens (Rand 1942: 487, Diamond 1972: 273).

#### **MOUNTAIN MOUSE-WARBLER** *Crateroscelis robusta*

The Kumawa population (Fig. 5) does not resemble its geographically closest relatives, the sexually monomorphic races of the Arfak and Tamrau Mountains, and of the western Central Range. Instead, it recalls the more distant sexually dimorphic *C. r. robusta* of the eastern Central Range, from which both male and female plumages differ in colour traits (Diamond 1985). In many parts of New Guinea *C. robusta* and its lowland relative Rusty Mouse-Warbler *C. murina* have altitudinal ranges that are mutually exclusive (Diamond 1972). However, in Central Kumawa their altitudinal ranges overlapped by at least 80 m, and we observed the two species within 100 horizontal metres of each other.

#### **PALE-BILLED SCRUBWREN** *Sericornis spilodera*

The song is a weak, slow, long, very high-pitched series of separate notes, alternating between higher and lower pitches like a faint, distant police siren, all within half an octave in pitch, repeated constantly at a rate of 1.2 notes per second.

#### **TROPICAL SCRUBWREN** *Sericornis beccarii*

Populations vary irregularly with respect to geography. Some are strongly patterned with whitish lores, forehead, throat and upperwing-covert tips, while others are drab with these markings reduced or virtually absent (Diamond 1969, 1985). The Fakfak and Kumawa populations are among the duller ones: the lores are unmarked and upperwing-coverts have only obscure pale tips, visible in the hand but usually invisible in the field. But all eight of the populations that JD has encountered (North Coastal Range, Cyclops Mountains, Yapen Island, Foja Mountains, Van Rees Mountains, Wandammen, Fakfak and Kumawa), including strongly patterned as well as virtually unpatterned populations, share similar, *Gerygone*-like, fast, light, high-pitched songs comprising a rapidly repeated three-note phrase.

**LARGE SCRUBWREN** *Sericornis nouhuysi*

Along with *Ptilinopus ornatus* and *Charmosyna josefinae*, this is the third Kumawa species confined to the highest elevations around our Top Camp. KDB saw and tape-recorded a singing pair and lone individual on 14–15 March 2013, foraging at heights of 6–10 m. Compared to *S. rufescens* at the same elevation and *S. virgatus* at lower elevations, this is a larger, heavier, larger billed bird. Like elsewhere in New Guinea, the song in Kumawa is a *Gerygone*-like three-note phrase repeated at a rate of 1.5–1.6 phrases per second, similar to *S. virgatus* but lighter, less energetic, clearer, sweeter and possibly higher pitched.

**VOGELKOP SCRUBWREN** *Sericornis rufescens*

The most abundant bird species at high elevations in Kumawa, otherwise known with certainty only from the Arfak and Tamrau Mountains, and possibly also in Fakfak (see below). Seven were mist-netted in Kumawa and examined closely. The overall impression is of a very small dingy nondescript bird, predominantly dirty olive rather than brown. The only distinctive feature is the dark eye that is obvious in the pale face, pale buffy or buffy-orange around the eye. The back is dull olive, the tail brown or has an obscure dark subterminal spot. The underparts are paler than the upperparts, pale dull buff slightly yellowish and streaky. The bill is small compared to *S. beccarii* (see below), which shares the same habitats. In habits, this species is a leaf-gleaner, mainly foraging below 5 m, occasionally up to 18 m, often several together and occasionally in mixed-species flocks. The call is a dry *chip* similar to Buff-faced Scrubwren *S. perspicillatus*. The song, heard mainly at dawn, is weak but vigorous, moderately fast, medium-high in pitch, with a slightly sibilant, unclear, unmusical quality. Each song comprises several types of phrases, each consisting of several notes, and each phrase repeated several times before going on to the next phrase. One such song is repeated several times at intervals of several seconds before switching to another pattern.

**GREY-GREEN SCRUBWREN** *Sericornis arfakianus*?

At high elevations in Fakfak in 1981, JD found to be abundant a small, dingy, nondescript *Sericornis* that he identified as *S. arfakianus*, with which he was previously familiar. At the time he had never encountered *S. rufescens*. Gibbs (1994) also reported seeing *S. arfakianus* daily at high elevations in Fakfak. But JD's field notes on the appearance of the small Fakfak *Sericornis* are similar to his notes on *S. rufescens*, which he encountered for the first time two years later in Kumawa. In retrospect, we are uncertain whether the common small *Sericornis* at high elevations in Fakfak is *S. arfakianus* or *S. rufescens*.

**MID-MOUNTAIN BERRYPECKER** *Melanocharis longicauda*

The Kumawa population observed by us, and evidently the Fakfak population seen by Gibbs, belong to a strikingly distinct undescribed subspecies or allospecies, characterised by the adult male's nearly white underparts (rather than yellowish olive-grey as in all other populations). The male has blue-black upperparts, white axillaries and white outer tail feathers. The female has olive upperparts and pale, slightly yellowish, obscurely streaky underparts, rather like the Fakfak berrypeckers that we provisionally identified as Streaked Berrypecker *M. striativentris* except for lacking an orange gape or rictal streak. Fairly common up to 9 m above ground (six individuals mist-netted, none collected) and joins mixed-species flocks. On 17 November 2014, at 1,200 m, B. Milá & C. Thébaud (*in litt.* 2015) mist-netted and collected an adult male similar overall to the birds that we observed.

**STREAKED BERRYPECKER** *Melanocharis striativentris*?

Seen twice by JD at 1,170 m in Fakfak, 5 m and 12 m above ground, consuming tiny berries. The diagnostic orange gape or rectal streak suggests this species rather than female *M. longicauda* (see below). The small bill was black, the upperparts and head olive, the underparts streaky yellow-olive or dirty lemon, and the tail was of mid length.

**BLUE JEWEL-BABBLER** *Ptilorrhoa caerulea*

In addition to very high-pitched faint clear notes at constant pitch, Kumawa and Fakfak birds share with north-west New Guinea populations a remarkable, loud, fast, dry, even-pitch, utterly unmusical rattle that reaches a crescendo.

**CHESTNUT-BACKED JEWEL-BABBLER** *Ptilorrhoa castanonota*

The call is a loud, quickly repeated *chew-chew*, deceptively similar to the call of Sooty Thicket-Fantail *Rhipidura threnothorax*, except that the latter always gives three *chew* notes, while the jewel-babbler gives its *chew* note once, twice or four times, but never thrice. Perhaps the jewel-babbler avoids three-note calls to avoid confusion with the fantail. The Kumawa population (Fig. 6) may prove to be subspecifically distinct (Diamond 1985).

**BARRED CUCKOOSHRIKE** *Coracina lineata*

Heard and seen calling once in North Kumawa, and heard once in South Kumawa. The call is a loud, high-pitched, piercing, sweet downslur, uttered once or twice in succession, and given either perched or in flight.

**PAPUAN CICADABIRD** *Edolisoma incertum*

Very common in both Fakfak and Kumawa at middle elevations, but absent in the lowlands. Heard more frequently than seen and easier to distinguish from other *Edolisoma* spp. (especially from *E. schisticeps*) by voice than by sight. Vocalisations vary geographically within New Guinea. In Kumawa and Fakfak we identified four vocalisations, all of which can be given by the same individual. One is a long rapid series of 27–60 notes on the same pitch, delivered at a rate of five notes per second for up to 12 seconds, decelerating towards the end, usually single notes but sometimes disyllabic, and typically mellow, musical and clear in tone, but sometimes simultaneously buzzy and musical. The second vocalisation is a slower, shorter series of 11–28 disyllabic notes at a rate of 1.6–2.0 notes per second, buzzy and not musical, heard in North Kumawa but not in South Kumawa or Fakfak. The third is a nasal call of 2–3 notes, repeated usually four times; the first note short, the second or third usually downslurred but sometimes upslurred. The last call is given in flight or when about to fly: a brief, musical, cheerful *tn-whit*, the first note short, the second slurred (usually upslurred). In north New Guinea but never in Fakfak or Central or South Kumawa, JD also often heard a distinctive, musical, mellow short *tp*.

**COMMON CICADABIRD** *Edolisoma tenuirostre*

One record: a pair in female plumage in second growth 6 m tall, 100 m from the beach in North Kumawa. Except for the resident population in southern New Guinea, individuals on the New Guinea mainland are mostly or entirely winter visitors from Australia to non-forest habitats.

**BLACK PITOUI** *Melanorectes nigrescens*

Both black and brown individuals (presumably male and female, respectively) at high elevations in Fakfak and Kumawa. Brown birds are superficially very similar to Vogelkop



Bowerbird *Amblyornis inornata* and Little Shrikethrush *Colluricincla megarhyncha*, but the strongly hooked bill is a good field mark if seen well. Unlike *Pitohui dichrous*, *P. kirhocephalus* and Rusty Pitohui *Pseudorectes ferrugineus* in behaviour: occurs singly or in pairs, rather than in flocks, and perches upright like a large, stolid robin. Recent molecular studies reveal that it is closer to the yellow species of *Pachycephala* than to *Pitohui* species (Jönsson *et al.* 2007, Dumbacher *et al.* 2008). At least three vocalisations were identified in Fakfak and Kumawa. The simplest is a prolonged medium-pitch upslur, given either once or twice at an interval of slightly more than one second. The quality is distinctive, in that half the note is hoarse, the other half clear with a quality like calls of *Colluricincla megarhyncha*; the hoarse half can either precede or follow the clearer half. A second call comprises a single short note followed by five breezy identical downslurs, lasts 2.5 seconds and is repeated every 10–12 seconds. The song is a loud, ascending and accelerating series of c.8 notes (reminiscent of some songs of Common Paradise Kingfisher *Tanysiptera galatea*, and a series of human burps), starting hoarser, but becoming less so during the series.

#### **REGENT WHISTLER** *Pachycephala schlegelii*

Common at high elevations on our two high-altitude Kumawa transects (South and Central Kumawa) and observed by Gibbs on Fakfak's summit above elevations reached by JD. At JD's highest South Kumawa camp (1,390 m), this was the loudest and most persistent dawn singer, and the nuclear species in mixed-species flocks. The unnamed Kumawa population is relatively small-bodied and possibly small-billed.

#### **SCLATER'S WHISTLER** *Pachycephala soror*

Common and noisy on all four Fakfak and Kumawa transects, occurring almost entirely at altitudes below Regent Whistler *P. schlegelii* (see above), with only slight altitudinal overlap on the South Kumawa transect. Songs comprise ringing repeated notes ending in louder slurs, but less loud than songs of *P. schlegelii*. The Kumawa population of *P. soror*, described as *P. s. octogenarii* (Diamond 1985), is the most distinctive named population of the Kumawas, and by far the most distinctive race of *P. soror*, if indeed it really belongs with *P. soror*. It is characterised by the male's extremely narrow dark breast-band and its female-like dark grey (not black) crown and head-sides. The unnamed Fakfak population is similar but differs in that the male's anterior breast immediately posterior to the breast-band is ochraceous, not yellow-olive.

#### **RUSTY WHISTLER** *Pachycephala hyperythra*

Elsewhere in New Guinea this is the common whistler of lower hill forests. In Fakfak and Kumawa it is puzzlingly rare. In Fakfak one specimen was collected by Doherty, with single observations each by JD and by Rheindt, and in Kumawa there was one observation by JD.

#### **HOODED PITOHUI** *Pitohui dichrous*

Occasionally found at sea level in parts of New Guinea, but not on its outlying mountain ranges, where it is an upland species, descending only to between 553 m and 841 m on our four transects. It inhabits middle elevations, with little or no altitudinal overlap with Black Pitohui *Melanorectes nigrescens* (see above) at higher elevations, and some overlap with Northern Variable Pitohui *Pitohui kirhocephalus* that occurs at lower elevations down to sea level. It is an abundant, noisy and nuclear species of mixed flocks, but is shy and remains concealed within foliage except for quick flights, and is heard far more often than seen.

Hooded Pitohui has at least six different vocalisations. The common flock song is a chatter comprising a series of medium-pitched mellow whistles, often starting with three

identical upslurs (first one, then after a slight pause a quick pair), similar to and confusable with the chatter of *P. kirhocephalus* but slower, clearer, less scratchy, less snapped and lower pitched. The second flock song, also comprising mellow to medium-pitched whistles, is related to the first: three quick, identical, equal-spaced upslurs without a longer interval between the first and second, followed by four slow notes—three on the same pitch, the fourth a downslur. The third song, much less common but more distinct, and apparently given by single individuals not in flocks, is a stereotyped, occasionally repeated, whistled, slow song of 2–4 notes, the first 1–3 notes on a constant pitch, the last a downslur. Calls include frequent soft growls given in flocks, and a fast dry even-pitch rattle similar to Greater Black Coucal *Centropus uenibeki*. Finally, there is a rarely heard call with a markedly bell-like quality similar to bell calls of *Oruorectes cristatus*, comprising 2–3 beautiful, clear, ringing notes on the same pitch, followed by one note several tones higher in pitch.

#### **GREATER MELAMPITTA** *Megalampitta gigantea*

Common only in areas of karst terrain, where it has the remarkable habit of roosting underground in sinkholes (Diamond 1983). Heard far more often than seen. It never responded to playback at any of the three locations we encountered the species (Fakfak, Kumawa and Kikori). The song is a loud ringing disyllable (either upslurred or downslurred) repeated monotonously *ad nauseam* at a mean rate of 1–2 notes per second, but a diagnostic feature is that the precise interval between notes varies irregularly from note to note. Not encountered in apparently suitable areas around Central Kumawa Top Camp, perhaps because the elevation was too high.

#### **TRUMPET MANUCODE** *Phonyganinus keraudrenii*

Abundant at middle elevations, calling frequently, often from a conspicuous treetop perch, in Fakfak and Kumawa. This species descends to the flat lowlands in southern New Guinea, but not in Fakfak, Kumawa or northern New Guinea. It often joins mixed brown and black flocks of pitohuis and other species. The wingbeats are loud. Many loud calls with different qualities are given, all of them single notes or disyllables. Especially common is a medium-pitched disyllable, the second note on a lower pitch and either clear and bell-like or slightly hoarse. Other calls are a similar disyllable but with a gulping quality, rather than like a bell; a short, staccato, monosyllabic gulp with a sharp initiation; a prolonged rasping *a-a-a-ah* in crescendo; a tremulous, fluttering, breath-like, crescendo; a short harsh rasp; and a short, staccato, slightly hoarse *whk*. Two dissimilar calls are often given as duets between distant birds, with no consistency in which type of call is given first and which second; *a-a-a-ah* or a rasp may be followed by a bell-like disyllable, or a bell-like disyllable is followed by *whk* or a rasp. An individual puffs up its body and holds its wings extended while calling.

#### **BLACK-BILLED SICKLEBILL** *Drepanornis albertisi*

In Kumawa mist-netted once, seen once in a mixed flock and heard calling three times.

#### **PARADIGALLA** *Paradigalla* sp.?

Gibbs reported seeing two paradigallas at high elevations in the Fakfaks, providing a sketched illustration. A paradigalla in the Fakfaks would be surprising, because paradigallas are not known from any outlying mountain range, except the much higher and larger Arfaks and their known altitudinal range lies mostly above the Fakfak summit. This interesting report awaits confirmation.

**LESSER GROUND-ROBIN** *Amalocichla incerta*

Abundant at high elevations in Kumawa, hopping on the ground. Not observed in Fakfak, whether because it is absent or because its elevational range lies mostly above the highest altitudes reached by ornithologists. Upperparts warm brown or orange-brown; clean white throat without black tips, becoming pale grey on the breast; obscure pale lores; a small concealed pale band in the wing. Nominate *A. i. incerta* of the Arfak Mountains differs in that its underparts below the throat are ochraceous or olive-brown. Race *olivascens* of central New Guinea differs in its black-tipped throat and possibly in its dorsal coloration. The brilliant, very long song commences with up to six staccato, hoarse, piercing notes at long intervals, accelerating into a long, fast, jumbled, high-pitched, piercing, slightly hoarse cascade of notes.

**ASHY ROBIN** *Heteromyias albispecularis*

In Kumawa abundant from 1,026 m to the summit, and the commonest singer at dawn, but not found in Fakfak despite that JD and Gibbs each spent several days in that altitudinal range. Hops on the ground and forages in the understorey, occasionally up to 5 m. Closest to the Vogelkop nominate race, but evidently a distinctive undescribed subspecies (Fig. 7): dark grey back and cheeks, brown wings and tail; pale grey breast, becoming pale ochraceous on lower belly and undertail-coverts; dark mask through eyes; clear white chin, extending as a band below the eyes; and a striking broad white supercilium. There are three songs, all consisting of whistled clear discrete notes. The dawn song is a ringing series of 4–17 medium-high notes at a rate of 4–7 notes per second, often repeated after a short pause to create the sense of a long, even-pitch series with frequent short interruptions. This song is reminiscent of that of Piping Bellbird *Ornorectes cristatus*, but the latter's song is uninterrupted and gradually accelerates. The second song is a fast medium-high series comprising many identical triplets, the third note of each at a slightly higher pitch than the first two, and the whole series preceded by a single note at the higher pitch of the third note of each triplet. The third song has various patterns of 2–4 medium-pitched notes ascending in pitch, confusingly similar to songs of Rusty Mouse-Warbler *Crateroscelis murina* but lower pitched and louder, and also similar to the three-note ascending call of Hook-billed Kingfisher *Melidora macrorrhina*.

**SMOKY ROBIN** *Peneothello cryptoleuca*

Abundant at high elevations in Kumawa and one of the commonest songsters there. Forages from the understorey up to 5 m, occasionally 9 m, often perching sideways on vertical trunks. The Kumawa population is an endemic subspecies *P. c. maximus* distinguished by its whitish underparts and large size (Diamond 1985); the white throat is especially obvious in the field. The song is a weak, tremulous, very fast whistled trill on a constant pitch, similar to the song of the Foja population, but lacking the latter's final disyllabic flourish. The call consists of 2–5 identical, loud, medium-pitched, *Pachycephala*-like short downslurs with sharp introductions. There are also loud alarm notes. In Fakfak, Gibbs (1994) listed the similar *P. cyanus* as frequent at elevations higher than those that JD reached in Fakfak, where JD did not observe any *Peneothello*; could the Fakfak birds observed by Gibbs be *P. cryptoleuca*, like the Kumawa population?

**BANDED YELLOW ROBIN** *Gennaedryas placens*

*G. placens* and Black-sided Robin *P. hypoleuca* are both strongly territorial. Ecological segregation depends largely on altitude, *G. placens* occurring at higher elevations. In Fakfak there was no altitudinal overlap: JD's highest observation of *P. hypoleuca* was at 494 m and



his lowest of *G. placens* was at 503 m. In North Kumawa two *G. placens* were encountered within the low-altitude range of *P. hypoleuca*, but with 100 m of horizontal separation from the nearest *P. hypoleuca*. *G. placens* prefers locally level terrain with an open understorey.

There are five common vocalisations: two songs and three calls. One song consists of 5–7 medium-pitched notes at a rate of three notes per second. All notes except the first are on the same pitch, while the first is either at the same pitch or a whole tone higher. This song is distinguished by its beautiful flute-like quality and by the sharp start to each note, like the pipes of a baroque organ or a person pronouncing the consonant 't'. A song of White-rumped Robin *Peneothello bimaculata* is similar. The other song is a weak, high- or medium-pitched, fast (five notes per second) whistled trill, which crescendos and decelerates slightly, either at constant pitch or slightly ascending or descending, and similar to a song of Blue-grey Robin *Peneothello cyaneus*. The shortest call is 1–2 harsh scolding notes like Fantailed Monarch *Symphysichrus axillaris*. A second call comprises 2–3 notes with the flute-like quality of the first song: the first note short and hoarse, the second (and occasionally third) a downslurred disyllable at a slighter higher pitch and not hoarse. The last call is a nasal, very rapidly repeated note at constant pitch, confusingly like a call of Spangled Drongo *Dicrurus bracteatus*, and so similar to a call of Shining Flycatcher *Myiagra alecto* that Fakfak and Kumawa natives confused the two species.

#### **WHITE-FACED ROBIN** *Tregellasia leucops*

The Kumawa and Fakfak populations of this common, geographically variable robin belong to the Vogelkop race *T. l. leucops* (Diamond 1985).

#### **RED-RUMPED SWALLOW** *Cecropis daurica*

A rare winter visitor to the New Guinea region: one at Fakfak airport on 13 March 2013, together with Pacific Swallows *H. tahitica* and Barn Swallows *H. rustica*. We noted the deeply forked tail, pale ochraceous rump and collar, and otherwise blue-black upperparts.

#### **WHITE-EYES** *Zosterops* sp.

In Kumawa we identified all three New Guinea mainland species of *Zosterops*, with readily distinguished songs. At low elevations in the hills (260–370 m), but absent from the flat lowlands, was Black-fronted White-eye *Z. atrifrons* with its unmistakable 'wheel' song: c.8 notes in a slightly descending series, with a quality like the turning of a wheel producing a sound at each rotation. At middle elevations (600–1,200 m) was New Guinea White-eye *Z. novaeguineae*, whose high-pitched, sweet, bright but loud song consisted of 1–5 slower introductory notes at 2–4 different pitches preceding a faster series of 5–8 notes all on the same lower pitch. The Kumawa population has a broad white eye-ring, yellow (not bright yellow-orange) throat, breast and undertail-coverts, white belly, and no black on the head. At Marsh Camp was Capped White-eye *Z. fuscicapilla*, uniformly yellow-olive except a white eye-ring and possibly a darker forehead, with a short, fast, medium-high-pitched, energetic, unmusical song. At Top Camp (1,654 m) we glimpsed white-eyes and heard their contact calls, without identifying them to species. In Fakfak JD and Rheindt both encountered *Z. atrifrons* at lower elevations and *Z. fuscicapilla* at high elevations, Gibbs found *Z. fuscicapilla* common at high elevations, and Doherty collected *Z. atrifrons* (presumably at low elevation). The only other New Guinea site besides Kumawa supporting all three species of *Zosterops* is Arfak, where Mayr collected all three without indications of altitude. The simplest interpretation, requiring confirmation, is that with increasing altitude *Z. atrifrons* is replaced by *Z. novaeguineae*, in turn replaced by *Z. fuscicapilla*, but with some overlap. Future observers in Fakfak should remain alert for the possible presence there, too, of *Z. novaeguineae*.

**GRAY'S GRASSHOPPER-WARBLER** *Locustella fasciolata*

We heard and tape-recorded one in rank grass near the forest edge adjacent to Kumawa Marsh Camp.

**GREY-STREAKED FLYCATCHER** *Muscicapa griseisticta*

JD observed one of this Asian winter visitor in a village clearing in Fakfak on 3–4 March 1981.

**EURASIAN TREE SPARROW** *Passer montanus*

Common in Fakfak town in March 2013, but absent when JD was there in 1981 and 1983. This introduced species arrived in New Guinea in the 1990s.

**BLUE-FACED PARROTFINCH** *Erythrura trichroa*

This finch's local abundance is known to vary enormously, in synchrony with local seedings of bamboo. During our visits we found it abundant in Fakfak and at our Central Kumawa Marsh Camp, but absent at our Central Kumawa Top Camp and on JD's North and South Kumawa transects.

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### Appendix: birds of the Fakfak and Kumawa Peninsulas

The table lists all bird species recorded from the Fakfak and Kumawa Peninsulas, including seabirds seen up to 1 km offshore. Asterisks in the left margin denote upland species as defined in the text. Entries in columns 2–5 consist of a double line, with Fakfak entries to the left and Kumawa entries to the right of the double line.

Column 1. Scientific and English species names.

Column 2. Records for Fakfak: a = JD in 1981 (plus a few records in 2013); D = Doherty in 1896; G = Gibbs in 1992; R = Rheindt in 2008–09; and S = Schädler in 1896. Records for Kumawa: b = JD in North Kumawa in 1983; c = JD in South Kumawa in 1983; d = JD & KDB in Central Kumawa in 2013; [a], [b], [c] = species described to us and reliably reported as present by local residents, but not observed by us; B = Bergman at Kambala in 1949.

Column 3. Estimates of abundance in the habitat and elevation of greatest abundance, only for our four surveys. 1 = just 1–2 records. 2 = from a min. of three, to a max. 7–12 records. 3 = from a min. 8–13, to a max. 14–28 records. 4 = the most abundant species, with more than a min. of 15–31 records. (The borderline min. and max. numbers of records differ between our four surveys, depending on the total number of records in each survey). - = not observed by us in that survey. x = observed by us in that survey, but no reliable abundance estimate available (usually because we spent too little time in the species' zone of peak abundance). The entries for our four surveys are in the format a || bcd (see column 2 for codes).

Column 4. Altitudinal ranges (in m), only for our four surveys. The entries for our four surveys are in the format a || b/c/d (see column 2 for codes). - = not observed by us in that survey. x = observed by us in that survey, but only limited information concerning altitudinal range.

Column 5. Left and right of double line: local name in the Baham language's dialect spoken in the Fakfak Mountains (mainly at Wanggasten and New Weri villages), and in Nusawulan village on the southern Kumawa coast, respectively.



Scientific and English names	Records	Abundance	Altitude	Local names
Cassowary <i>Casuarus</i> sp.	aGR    bcd	2    221	174–1,250    35–915 / 287–1,061/1,025	sorok    sorók
* Wattled Brushturkey <i>Aepyodius arfakianus</i>	a    cd	x    -x1	472–1,188    - / 1,437/1,654	yagóha
Brushturkey <i>Talegalla</i> sp.	aR    bc	2    22-	437–787    91–372/0–896/-	wáben    waban
Orange-footed Scrubfowl <i>Megapodius reinwardt</i>	[a]DR    cB	x    -x-	x    -/0/-	kabatyau    kobachau
Raja Shelduck <i>Tadorna radjah</i>	-    cB	-    -2-	-    -/0/-	
Pacific Black Duck <i>Anas superciliosa</i>	-    [c]d	-    -x2	-    -/x/1,025	itik
Storm-petrel <i>Oceanites</i> sp., <i>Fregetta</i> sp.	-    b	-    1--	-    0/-/-	
Tricoloured Grebe <i>Tachybaptus tricolor</i>	--    d	-    --2	-    -/-/1,025	
Nankeen Night-Heron <i>Nycticorax caledonicus</i>	-    b	-    1--	-    0/-/-	
Striated Heron <i>Butorides striata</i>	aS    cB	1    -1-	0    -/0/-	tarakóka
Great-billed Heron <i>Ardea sumatrana</i>	R    -	-    ---	-    -/-/-	
Eastern Great Egret <i>Ardea modesta</i>	-    c	-    -1-	-    -/0/-	
Intermediate Egret <i>Ardea intermedia</i>	-    c	-    -1-	-    -/0/-	
Eastern Reef-Egret <i>Egretta sacra</i>	S    bc	-    23-	-    0/0/-	kajóka
Australian Pelican <i>Pelecanus conspicillatus</i>	-    c	-    -1-	-    -/0/-	
Lesser Frigatebird <i>Fregata ariel</i>	a    bcB	1    22-	0    0/0/-	ichára
Brown Booby <i>Sula leucogaster</i>	-    cB	-    -1-	-    -/0/-	
Little Pied Cormorant <i>Microcarbo melanoleucos</i>	aR    c	1    -2-	0    -/0/-	sia
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>	R    b	-    1--	-    0/-/-	
Eastern Osprey <i>Pandion cristatus</i>	aS    bc	2    12-	0    0/0/-	wöseláu    waseláu
Pacific Baza <i>Aviceda subcristata</i>	DS    bc	-    21-	-    0/0/-	
Long-tailed Buzzard <i>Henicopernis longicauda</i>	G    cd	-    -11	-    -/1,437 / 1,025	sarewan
Brahminy Kite <i>Haliastur indus</i>	aRS    bc	2    22-	0    0/0/-	kaím-boet    kiwa
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	aD    bc	2    12-	0    0/0/-	lusi
Variable Goshawk <i>Accipiter hiogaster</i>	G    cB	-    -1-	-    -/0/-	
Grey-headed Goshawk <i>Accipiter poliocephalus</i>	aGRS    d	-    --1	690    -/-/ 1,025	serábi
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>	-    b	-    1--	-    305/-/-	
Meyer's Goshawk <i>Accipiter cf. meyerianus</i>	-    d	-    --1	-    -/-/1,025	
New Guinea Harpy-Eagle <i>Harpyopsis novaeguineae</i>	aR    b[c]d	2    2x2	747–1,208    260–906 /x/ 1,055–1,158	kikma    toktók
Gurney's Eagle <i>Aquila gurneyi</i>	-    d	-    --1	-    -/-/1,025	
* White-striped Forest-Rail <i>Rallidula leucospila</i>	-    cd	-    -32	-    -/1,009–1,417/1,025–1,654	
Crake sp.	-    d	-    --1	-    -/-/1,025	

Scientific and English names	Records	Abundance	Altitude	Local names
Rufous-tailed Bush-hen <i>Amaurornis moluccana</i>	{a}    -	x    ---	x    -/-	kidi-kidi
Beach Stone-curlew <i>Esacus magnirostris</i>	-    c	-    -2-	-    -/0/-	sikéken lemóra
Pacific Golden Plover <i>Pluvialis fulva</i>	a    -	1    ---	122    -/-	
Sand-plover <i>Charadrius</i> sp.	-    c	-    -1-	-    -/0/-	sikéke
Whimbrel <i>Numenius phaeopus</i>	aS    c	1    -2-	0    -/0/-	tabak-tabir
Common Greenshank <i>Tringa nebularia</i>	-    c	-    -1-	-    -/0/-	
Tattler <i>Tringa</i> sp.	-    c	-    -1-	-    -/0/-	
Common Sandpiper <i>Actitis hypoleucos</i>	aS    c	1    -2-	0    -/0/-	sikéke
Sanderling <i>Calidris alba</i>	-    c	-    -1-	-    -/0/-	
Red-necked Stint <i>Calidris ruficollis</i>	-    c	-    -1-	-    -/0/-	sikéke
Crested Tern <i>Thalasseus bergii</i>	a    bc	x    xx-	0    0/0/-	
Little Tern <i>Sternula albifrons</i>	a    -	x    ---	0    -/-	
Bridled Tern <i>Onychoprion anaethetus</i>	a    c	x    -x-	0    -/0/-	
Roseate Tern <i>Sterna dougallii</i>	-    bc	-    xx-	-    0/0/-	kananáwa
Black-naped Tern <i>Sterna sumatrana</i>	a    bc	x    xx-	0    0/0/-	kananáwa
Common Tern <i>Sterna hirundo</i>	a    bc	x    xx-	0    0/0/-	kananáwa
White-throated Pigeon <i>Columba vitiensis</i>	S    -	-    ---	-    -/-	
Great Cuckoo-Dove <i>Reinwardtoena reinwardti</i>	aDGS    bd	3    3-2	0-788    260-742/-/1,025-1,654	
Brown Cuckoo-Dove <i>Macropygia amboinensis</i>	aDGS    bcdB	3    212	575-1,261    427-906/1,137-1,234/1,025-1,036	kuwók-kuwók
Black-billed Cuckoo-Dove <i>Macropygia nigrirostris</i>	aDG    bcd	4    124	0-1,261    713/483-1,378/1,025-1,654	koa-koa
New Guinea Bronzewing <i>Henicophaps albifrons</i>	R    bcB	-    21-	-    604-802/113/-	
Cinnamon Ground-Dove <i>Gallicolumba rufigula</i>	a    bdB	2    2-1	690-863    640-695/-/1,025	kambrat, tuyuk-tuyuk
* Bronze Ground-Dove <i>Alopecoenas beccarii</i>	-    d	-    -1	-    -/-/1,143	
* Pheasant Pigeon <i>Otidiphaps nobilis</i>	aR    bd	3    1-2	344-963    325-747/-/1,025-1,207	kwaha, waiás
Western Crowned Pigeon <i>Goura cristata</i>	aGR    bcB	2    22-	437-690    223-579/0-433/-	yemu    yemu
Stephan's Ground-Dove <i>Chalcophaps stephani</i>	aDGRS    b[c]dB	2    1x1	366-533    172-183/x/1,025-1,097	
Wompoo Fruit-Dove <i>Ptilinopus magnificus</i>	aDGRS    bB	3    3--	273-774    67-553/-	suwinawáu
Pink-spotted Fruit-Dove <i>Ptilinopus perlatus</i>	aR    b	3    4--	242-690    67-623/-	
* Ornate Fruit-Dove <i>Ptilinopus ornatus</i>	DGR    d	-    -2	x    -/-/1,654	
Orange-fronted Fruit-Dove <i>Ptilinopus aurantiifrons</i>	-    cB	-    -1-	-    -/0/-	tota

Scientific and English names	Records	Abundance	Altitude	Local names
Superb Fruit-Dove <i>Ptilinopus superb</i>	aDGRS    bcdB	4    423	69–1,189    99–906/396–1,389/1,025–1,071	mabúm, tuk-tugúri
Coroneted Fruit-Dove <i>Ptilinopus coronulatus</i>	aR    b	1    2--	684–787    204–273/-/-	
Beautiful Fruit-Dove <i>Ptilinopus pulchellus</i>	aDRS    b	4    4--	69–841    67–579/-/-	wihía
* Mountain Fruit-Dove <i>Ptilinopus bellus</i>	aGR    bcd	3    344	810–1,314    387–905/877–1,414/1,025–1,654	wihía
* Claret-breasted Fruit-Dove <i>Ptilinopus viridis</i>	aD    bd	4    4-2	69–1,208    229–937/-/1,025–1,158	
Orange-bellied Fruit-Dove <i>Ptilinopus iozonus</i>	aR    b	2    3--	69–504    0–520/-/-	
Dwarf Fruit-Dove <i>Ptilinopus nainus</i>	aR    b	2    2--	69–690    67–347/-/-	kwan-kwan,nak-négrem, tuk-tugúri
Elegant Imperial Pigeon <i>Ducula concinna</i>	-    c	-    -1-	-    -/0/-	wisúk
Purple-tailed Imperial Pigeon <i>Ducula rufigaster</i>	aDGR    b[c]	3    3x-	198–906    67–579/x/-	
Pinon Imperial Pigeon <i>Ducula pinon</i>	aGRS    bcB	3    4x-	0–789    0–520/0–512/-	wapi    wapi
Zoe's Imperial Pigeon <i>Ducula zoeae</i>	aDGR    bcB	3    31-	0–963    41–906/0/-	tuk-tugúri
Pied Imperial Pigeon <i>Ducula bicolor</i>	-    c	-    -2-	-    -/0/-	mumur
* Papuan Mountain-Pigeon <i>Gymnophaps albertisii</i>	aG    d	2    --2	787–1,208    -/-/1,025–1,654	kondágo
Palm Cockatoo <i>Probosciger aterrimus</i>	aDGRS    bcd	2    212	690–1,208    0–728/0–483/1,025–1,219	kweyong    kweyong
Sulphur-crested Cockatoo <i>Cacatua galerita</i>	aDGRS    bc	3    32-	0–1,208    0–742/0–137/-	katóa    katúak
* Red-flanked Lorikeet <i>Charmosyna placentis</i> and /or Red-fronted Lorikeet <i>C. rubronotata</i>	aR    bcd	2    212	634    138–553/923/1,025–1,654	
* Fairy Lorikeet <i>Charmosyna pulchella</i>	aG    cd	2    -12	722–1,189    -/1,389–1,408/1,654	
* Josephine's Lorikeet <i>Charmosyna josephinae</i>	a    d	1    --2	1,189    -/-/1,654	
Black-capped Lory <i>Lorius lory</i>	aDGRS    bc	3    4x-	0–1,189    0–906/0–524/-	wereré    wararói
Dusky Lory <i>Pseudeos fuscata</i>	aGS    B	2    ---	0–1,208    -/-/-	rita
Black Lory <i>Chalcopsitta atra</i>	aR    B	1    ---	0    -/-/-	
Rainbow Lorikeet <i>Trichoglossus haematodus</i>	aDRS    bcdB	3    442	0–1,208    0–906/0–1,437/1,025–1,654	kikáras    sikáras
Large Fig-Parrot <i>Psittaculirostris desmarestii</i>	aDRS    bB	1    2--	0    0–457/-/-	
Orange-breasted Fig-Parrot <i>Cyclopsitta gulelmitertii</i>	R    d	-    --1	-    -/-/1,025–1,109	
Double-eyed Fig-Parrot <i>Cyclopsitta diophthalma</i>	R    -	-    ---	-    -/-/-	
Moluccan King-Parrot <i>Alisterus amboinensis</i>	aDGR    bcdB	3    4x2	198–881    82–906/113–158/1,025–1,654	sana
Eclectus Parrot <i>Eclectus roratus</i>	aDGRS    bcB	2    22-	0–600    0–595/0/-	Iskari (male), peta (female)    baying, sarek



Scientific and English names	Records	Abundance	Altitude	Local names
Red-cheeked Parrot <i>Geoffroyus geoffroyi</i>	aDRS    bc	2    31-	0–625    67–579/192–1,210/-	penong-penong
* Blue-collared Parrot <i>Geoffroyus simplex</i>	a    bcd	3    322	617–1,314    553–906/1,052– 1,234/1,025–1,219	gwíning-gwínóng, geruán
Yellow-capped Pygmy Parrot <i>Micropsitta keiensis</i>	aDRS    b	1    2--	273    375–553/-/-	sikowbá-kowbá    bisibos
* Red-breasted Pygmy Parrot <i>Micropsitta bruijnii</i>	aD    bcd	2    223	774–906    704–762/1,424– 1,437/1,067–1,654	bis'nbao
Greater Black Coucal <i>Centropus menbeki</i>	aDGRS    b[c]B	2    2x-	0–690    0/x/-	kuhúbu    kuwúwu
Lesser Black Coucal <i>Centropus berusteini</i>	R    -	-    ---	-    -/-/-	
Dwarf Koel <i>Microdynamis parva</i>	a    bc	3    31-	0–787    260–770/0–483/-	
Eastern Koel <i>Eudynamis orientalis</i>	aS    d	2    --2	690–787    -/-/1,025	
Channel-billed Cuckoo <i>Scythrops novaehollandiae</i>	R    b	-    2--	-    0-685/-/-	
* Rufous-throated Bronze Cuckoo <i>Chalcites ruficollis</i>	-    d	-    --1	-    -/-/1,025	
* White-eared Bronze Cuckoo <i>Chalcites meyerii</i>	DG    bc	-    32-	-    397–906/113–1,437/-	
Little Bronze Cuckoo <i>Chalcites minutillus</i>	a    c	2    -1-	690    -/113/-	
White-crowned Cuckoo <i>Caliechthrus leucolophus</i>	aD    b	2    3--	684–863    191–802/-/-	kwándandong
Chestnut-breasted Cuckoo <i>Cacomantis castaneiventris</i>	aGR    bcd	3    422	509–1,189    168–906/265– 1,137/1,025–1,158	
Brush Cuckoo <i>Cacomantis variolosus</i>	aDGR    b	2    2--	0–690    0-405/-/-	
Sooty Owl <i>Tyto tenebricosa</i>	aG    bd	1    1-2	787–1,208    405–520/- /1,025	
Rufous Owl <i>Ninox rufa?</i>	G?    -	-    ---	-    -/-/-	
Papuan Boobook <i>Ninox theomacha</i>	[D]G    bcd	-    x12	-    520–802/923/1,025	tutuákmu
Marbled Frogmouth <i>Podargus ocellatus</i>	aDG    bc	1    31-	690    520–802/923/-	kabung-kabung
Papuan Frogmouth <i>Podargus papuensis</i>	RS    bcd	-    111	-    405/0/1,025	kuni
Large-tailed Nightjar <i>Caprimulgus macrurus</i>	-    c	-    -2-	-    -/0/-	marap-tenten
* Feline Owlet-Nightjar <i>Aegotheles insignis</i>	-    d	-    --2	-    -/-/1,025	
* Mountain Owlet-Nightjar <i>Aegotheles albertsi</i>	-    cd	-    -x2	-    -/1,450/1,025–1,654	
owlet-nightjar <i>Aegotheles</i> sp.	-    b	-    x--	-    183/-/-	
Moustached Treeswift <i>Hemiprocne mystacea</i>	[a]R    b	x    2--	x    0–906/-/-	pées-pées
Glossy Swiftlet <i>Collocalia esculenta</i>	aGR    bcd	3    322	0–1,313    0–906/0– 1,437/1,025–1,654	
* Mountain Swiftlet <i>Aerodramus hirundinaceus</i>	a    cd	3    -x2	1,167–1,208    -/1,097/1,025–1,161	
Uniform Swiftlet <i>Aerodramus vanikorensis</i>	aGR    bc	3    23-	0–690    0–906/0–483/-	yaya

Scientific and English names	Records	Abundance	Altitude	Local names
Papuan Spinetailed Swift <i>Mearnsia novaeguineae</i>	R    -	-    ---	-    -/-/-	
Oriental Dollarbird <i>Eurystomus orientalis</i>	RS    bc	-    11-	-    0/0/-	pelangor
Common Paradise-Kingfisher <i>Tanysiptera galatea</i>	aRS    bcB	1    31-	531    67–649/113–125/-	tadap    kwau
Red-breasted Paradise-Kingfisher <i>Tanysiptera uynplua</i>	aGS    -	x    ---	358    -/-/-	
Hook-billed Kingfisher <i>Melidora macrorrhina</i>	aGRS    bc	2    21-	0–787    0–906/0–1,259/-	
Rufous-bellied Kookaburra <i>Dacelo gaudichaud</i>	aDGRS    bcB	2    21-	0–226    66–906/0/-	makob    tongero
Collared Kingfisher <i>Todiramphus chloris</i>	S    c	-    -2-	-    -/0/-	tangsupa
Sacred Kingfisher <i>Todiramphus sanctus</i>	R    c	-    -2-	-    -/0/-	
Yellow-billed Kingfisher <i>Syna torotoro</i>	aDGRS    bcdB	3    321	0–939    0–906/113–1,437/1,025	werero
Common Kingfisher <i>Alcedo atthis</i>	-    b	-    1--	-    0/-/-	
Papuan Dwarf Kingfisher <i>Ceyx solitarius</i>	aDRS    bc	2    23-	617–690    162–658/0–902/-	
Azure Kingfisher <i>Ceyx azureus</i>	DS    -	-    ---	-    -/-/-	tangsupa
Little Kingfisher <i>Ceyx pusillus</i>	R    -	-    ---	-    -/-/-	
Rainbow Bee-eater <i>Merops ornatus</i>	G    b	-    1--	-    0–379/-/-	
Blyth's Hornbill <i>Rhyticeros plicatus</i>	aDGRS    bcB	3    32-	0–963    0–906/0–341/-	wamó    wamor
Red-bellied Pitta <i>Erythropitta erythrogaster</i>	aDGRS    bcB	2    22-	457–690    405–579/287–875/-	tuwáka
Hooded Pitta <i>Pitta sordida</i>	aDRS    bcB	1    22-	531–690    195–405/0–433/-	kwo-kwaré
White-eared Catbird <i>Ailuroedus buccoides</i>	R    bc	-    21-	-    182–573/0–207/-	
* Black-eared Catbird <i>Ailuroedus melanotis</i>	aGR    bcd	2    232	1,189    610–906/841–1,234/1,025–1,158	
* Vogelkop Bowerbird <i>Amblyornis inornata</i>	[a]GR    cd	x    -42	-    -/1,052–1,437/1,025–1,654	
* Masked Bowerbird <i>Sericulus aureus?</i>	?    -	-    ---	-    -/-/-	
Wallace's Fairywren <i>Sipodotus wallacii</i>	aD    b	1    1--	575    390–728/-/-	
Broad-billed Fairywren <i>Chenorhamphus grayi</i>	-    b	-    2--	-    296–553/-/-	
Emperor Fairywren <i>Malurus cyanecephalus</i>	aDRS    B	1    ---	690    -/-/-	
White-shouldered Fairywren <i>Malurus alboscapulatus</i>	-    d	-    --4	-    -/-/1,025	
* Red-collared Myzomela <i>Myzomela rosebergii</i>	aGR    cd	3    -13	1,171–1,190    -/1,408/1,654	sangédit
Dusky Myzomela <i>Myzomela obscura</i>	-    B	-    ---	-    -/-/-	
Ruby-throated Myzomela <i>Myzomela eques</i>	aD    -	2    ---	635–690    -/-/-	
* Red Myzomela <i>Myzomela cruentata</i>	aDGR    -	2    ---	684–1261    -/-/-	wis-wis

Scientific and English names	Records	Abundance	Altitude	Local names
Papuan Black Myzomela <i>Myzomela nigrita</i>	aDS    B	2    ---	723–774    -/-/-	
Green-backed Honeyeater <i>Glycichaera fallax</i>	aDR    b	1    2--	690–787    351–770/-/-	
* Rufous-sided Honeyeater <i>Ptiloprora erythropleura</i>	aG    cd	4    -44	1,207–1,314    -/1,286–1,437/1,097–1,654	
Streak-headed Honeyeater <i>Pycnopygius stictocephalus</i>	-    b	-    2--	-    0–378/-/-	
Silver-eared Honeyeater <i>Lichmera albaauricularis</i>	R    -	-    ---	-    -/-/-	
Tawny-breasted Honeyeater <i>Xanthotis flaviventer</i>	aDRS    bcdB	4    422	367–1,208    61–906/125–658/1,178–1,158	
* Spotted Honeyeater <i>Xanthotis polygrammus</i>	a    -	1    ---	635    -/-/-	
Meyer's Friarbird <i>Philemon meyeri</i>	a    bc	3    21-	172–684    0–274/0–207/-	
Helmeted Friarbird <i>Philemon buceroides</i>	aDRS    bc	4    44-	0–579    0–671/0–1,030/-	kowok    kówok
* Smoky Honeyeater <i>Melipotes</i> sp.	aGR    cd	2    -33	1,189–1,261    -/1,389–1,426/1,653	
Long-billed Honeyeater <i>Melilestes megarhynchus</i>	aDGR    bcd	3    312	0–1,189    262–906/1,402/1,025–1,113	
* Olive Straightbill <i>Timeliopsis fulvigula</i>	G    -	-    ---	-    -/-/-	
Tawny Straightbill <i>Timeliopsis griseigula</i>	R    b	-    1--	-    610–770/-/-	
* Vogelkop Melidectes <i>Melidectes leucostephes</i>	G    cd	-    -22	-    -/844–1,408/1,025–1,654	
Varied Honeyeater <i>Gavicalis versicolor</i>	-    cB	-    -x-	-    -/0/-	totekweras
Puff-backed Meliphaga <i>Meliphaga aruensis</i>	a    -	1    ---	684    -/-/-	
Yellow-gaped Meliphaga <i>Meliphaga flavirictus</i>	R    -	-    ---	-    -/-/-	
* White-eared Meliphaga <i>Meliphaga montana</i>	aDR    b	4    2--	657–966    387–729/-/-	
* Mountain Meliphaga <i>Meliphaga orientalis</i>	aR    bcd	3    442	975–1,189    688–906/1,137–1,437/1,025–1,128	kombuwéyo
Mimic Meliphaga <i>Meliphaga analoga</i>	aDRS    bcB	2    33-	0–856    229–664/244–506/-	
Scrub Meliphaga <i>Meliphaga albonotata</i>	DR    bc	-    11-	-    0/0/-	
* Goldenface <i>Pachycare flavogriseum</i>	a    --	4    ---	787–1,208    -/-/-	
Rusty Mouse-Warbler <i>Crateroscelis murina</i>	aDGR    bcd	4    443	0–1,314    0–906/0–1,314/1,025–1,100	siriri    siriri
* Mountain Mouse-Warbler <i>Crateroscelis robusta</i>	G    cd	-    -33	-    -/1,389–1,437/1,025–1,654	
Pale-billed Scrubwren <i>Sericornis spilodera</i>	aGR    bcd	2    311	690–963    235–905/483–1,250/1,025	
* Tropical Scrubwren <i>Sericornis beccarii</i>	aGR    bcd	4    332	1,170–1,261    677–906/1,137–1,402/1,025	sisi
* Large Scrubwren <i>Sericornis nouhuysi</i>	-    d	-    --1	-    -/-/1,654	



Scientific and English names	Records	Abundance	Altitude	Local names
* Vogelkop Scrubwren <i>Sericornis rufescens</i>	a?G?    cd	x    -44	1,170–1,261    -/975–1,437/1,025–1,654	sisi
* Grey-green Scrubwren <i>Sericornis arfakianus?</i>	a?G?    -	?    ---	?    -/-/-	
* Grey Thornbill <i>Acanthiza cinerea</i>	aG    c	2    -3-	1,170–1,261    -/1,003–1,422/-	
Yellow-bellied Gerygone <i>Gerygone chrysogaster</i>	aDGR    bcB	4    42-	172–788    67–704/113–523/-	
Green-backed Gerygone <i>Gerygone chloronota</i>	a    bc	3    42-	0–787    0–847/82–171/-	
Fairy Gerygone <i>Gerygone palpebrosa</i>	aDGR    bc	4    41-	172–835    61–906/113/-	
Large-billed Gerygone <i>Gerygone magnirostris</i>	DR    c	-    -1-	-    -/0/-	
* Brown-breasted Gerygone <i>Gerygone ruficollis</i>	aGR    bcd	4    322	787–1,314    742–906/832– 1,234/1,025–1,158	suondénde
Papuan Babbler <i>Garritornis isidorei</i>	aDRS    bB	2    2--	172–774    47–405/-/-	wasisía
Black Berrypecker <i>Melanocharis nigra</i>	DGRS    b	-    3--	-    67–553/-/-	
* Mid-mountain Berrypecker <i>Melanocharis longicauda</i>	G    bcd	-    132	-    906/1,082–1,437/1,025– 1,036	
* Streaked Berrypecker <i>Melanocharis striativentris?</i>	a?    -	x    ---	?1,170    -/-/-	
Spectacled Longbill <i>Oedistoma iliophus</i>	aG    bcd	3    341	360–1,234    262–906/1,021–1,422/1,021	
Pygmy Longbill <i>Oedistoma pygmaeum</i>	aD    -	1    ---	634–774    -/-/-	
Yellow-bellied Longbill <i>Toxorhamphus novaeguineae</i>	aDGR    bcd	4    431	172–1,189    67–906/171– 1,247/1,025	túwis-táwas
Blue Jewel-babbler <i>Ptilorrhoa caerulescens</i>	a    b	2    2--	177–690    67–280/-/-	arará
* Chestnut-backed Jewel-babbler <i>Ptilorrhoa castanonota</i>	aR    bcd	3    223	617–1,189    381–906/844– 1,250/1,025–1,219	das-das
Yellow-breasted Boatbill <i>Machaerirhynchus flaviventer</i>	aDR    bc	3    32-	504–906    290–906/113–171/-	
* Black-breasted Boatbill <i>Machaerirhynchus nigripectus</i>	G    d	-    --2	-    -/-/1,025–1,654	
Lowland Peltops <i>Peltops blainvillii</i>	DR    -	-    ---	-    -/-/-	
* Mountain Peltops <i>Peltops montanus</i>	aGR    b	2    2--	684–690    604–906/-/-	sererángo
Black Butcherbird <i>Cracticus quoyi</i>	aDRS    b	2    3--	0–690    0–575/-/-	
Hooded Butcherbird <i>Cracticus cassicus</i>	aDRS    bc	3    32-	0–558    0–573/0/-	kavét    kowet
White-breasted Woodswallow <i>Artamus leucorhynchus</i>	S    bc	-    13-	-    0/0/-	
* Great Woodswallow <i>Artamus maximus</i>	aG    d	1    --2	1,189–1,311    -/-/1,025– 1,158	kwas-kwas    gwas-gwas
* Stout-billed Cuckooshrike <i>Coracina caeruleogrisea</i>	aGR    bd	1    2-2	1,189    640–802/-/1,025	
* Barred Cuckooshrike <i>Coracina lineata</i>	-    bd	-    1-1	-    728/-/1,025	
Boyer's Cuckooshrike <i>Coracina boyeri</i>	aRS    b	2    2--	69–787    0–579/-/-	
White-bellied Cuckooshrike <i>Coracina papuensis</i>	aDRS    bc	1    22-	61    0–219/0/-	timtímur
Black-browed Triller <i>Lalage atrovirens</i>	aR    bc	2    11-	501–690    0–283/616/-	

Scientific and English names	Records	Abundance	Altitude	Local names
* Black-bellied Cicadabird <i>Edolisoma montanum</i>	aG    bcd	3    322	863–1,314    786–906/1,036– 1,259/1,025–1,219	uriyási
* Papuan Cicadabird <i>Edolisoma incertum</i>	aGR    bc	3    43-	690–787    518–906/403–1,128/-	uriyási
Common Cicadabird <i>Edolisoma tenebrosus</i>	-    b	-    1--	-    0/-/-	
Grey-headed Cuckooshrike <i>Edolisoma schisticeps</i>	aD    b	3    3--	573–835    0–671/-/-	
Black Cicadabird <i>Edolisoma melas</i>	aDR    bcB	4    31-	172–905    67–770/0/-	uriyási
* Varied Sittella <i>Daphoenositta chrysoptera</i>	R    -	-    ---	-    -/-/-	
* Rufous-naped Bellbird <i>Alcedo rufinucha</i>	G    d	-    --1	-    -/-/1,025–1,189	
* Piping Bellbird <i>Ornorectes cristatus</i>	aGR    bcd	2    422	657–988    573–937/483– 1,137/1,025	wobwób
Little Shrike Thrush <i>Colluricincla megarrhynchos</i>	aDGR    bcd	4    433	172–1,259    0–876/287– 1,055/1,025	kombas
Rusty Pitohui <i>Pseudorectes ferrugineus</i>	aDGRS    bcB	3    422	369–1,261    61–906/0– 524/1,025–1,117	wasisia, tuk-tókma
* Black Pitohui <i>Melanorectes nigrescens</i>	aG    cd	1    -31	1,283    -/1,359–1,437/1,654	wasisi
* Regent Whistler <i>Pachycephala schlegelii</i>	G    cd	-    -42	-    -/1,389–1,424/1,654	
* Sclater's Whistler <i>Pachycephala soror</i>	aGR    bcd	3    333	690–1,228    375–906/738– 1,402/1,025–1,036	
* Rusty Whistler <i>Pachycephala hyperythra</i>	aDR    b	1    1--	690    671/-/-	wechákab
Grey Whistler <i>Pachycephala simplex</i>	aDGRS    bc	3    43-	271–787    67–906/113–805/-	
Northern Variable Pitohui <i>Pitohui kirhocephalus</i>	aDGRS    bc	4    44-	0–1,189    0–802/0–774/-	tok-tók-waras    totókweras
* Hooded Pitohui <i>Pitohui dichrous</i>	aGR    bcd	4    434	690–1,314    553–906/841– 1,262/1,025–1,219	tok-tók-waras
Brown Oriole <i>Oriolus szalayi</i>	aDRS    bc	2    32-	0–558    0–728/0–616/-	
Shining Flycatcher <i>Myiagra alecto</i>	[a]DRS    bc	x    11-	x    0/0/-	sororo    sororó
Friiled Monarch <i>Arses telescopthalmus</i>	aDGRS    bcB	4    4x-	203–1,208    61–906/113–512/-	kabik-kabik
* Fantailed Monarch <i>Symplesiarchus axillaris</i>	aGR    bcd	3    312	774–1,234    652–906/1,055/1,025	kabik-kabik
Rufous Monarch <i>Symplesiarchus rubicundus</i>	-    b	-    1--	-    280/-/-	
Hooded Monarch <i>Symplesiarchus manadensis</i>	DR    b	-    1--	-    219–280/-/-	
Spot-winged Monarch <i>Symplesiarchus guttula</i>	aGR    bc	3    21-	172–811    290–693/171–738/-	
Golden Monarch <i>Artocoris chrysomela</i>	aDGR    bB	3    3--	172–788    219–728/-/-	
* Black-winged Monarch <i>Monarcha frater</i>	aGR    bcd	3    432	689–963    411–906/512– 1,250/1,025–1,177	sowéba
Spangled Drongo <i>Dicrurus bracteatus</i>	aDRS    bc	2    33-	0–552    0–750/0–1,018/-	kakasía

Scientific and English names	Records	Abundance	Altitude	Local names
* Pygmy Drongo <i>Chaetorhynchus papuensis</i>	aGR    bcd	3    324	690–1,250    622–906/738–1,390/1,025–1,158	damdámundu
Willie Wagtail <i>Rhipidura leucophrys</i>	aDS    bc	1    22-	0    0/0/-	sikapapóre
Black Thicket-Fantail <i>Rhipidura maculipectus</i>	R    -	-    ---	-    -/-/-	
White-bellied Thicket-Fantail <i>Rhipidura leucothorax</i>	DR    -	-    ---	-    -/-/-	
Sooty Thicket-Fantail <i>Rhipidura threnothorax</i>	aDRS    bc	3    31-	172–788    67–567/0–46/-	
Rufous-backed Fantail <i>Rhipidura rufidorsa</i>	aDGR    bc	3    32-	172–811    53–937/113–616/-	
* Black Fantail <i>Rhipidura atra</i>	aG    bcd	4    244	1,002–1,261    686–906/1,036–1,347/1,025–1,654	
* Friendly Fantail <i>Rhipidura albolimbata</i>	G    cd	-    -43	-    -/1,250–1,437/1,025–1,654	
Chestnut-bellied Fantail <i>Rhipidura hyperythra</i>	aR    bc	4    41-	172–920    67–906/171–483/-	sihánut
Northern Fantail <i>Rhipidura rufiventris</i>	aDGRS    bcd	4    321	69–796    0–671/0–738/1,036–1,654	sihánut
Grey Crow <i>Corvus tristis</i>	aDGRS    bc	2    32-	0–1,189    188–738/0–805/-	kweyang    kokwéyong
Torresian Crow <i>Corvus orru</i>	aDS    bcB	2    22-	0–67    0–46/0/-	ngoya    gwarás
* Greater Melampitta <i>Megalampitta gigantea</i>	aR    bcd	3    331	835–1,289    680–906/722–1,389/1,036	suáran
* Trumpet Manucode <i>Phonygamus keraudrenii</i>	aDGRS    bd	4    4-4	399–1,170    128–906/-/1,025–1,158	tokidi
Crinkle-collared Manucode <i>Manucodia chalybatus</i>	aDGRS    bcd	3    432	359–787    235–906/1,234–1,422/1,025–1,128	wisma
Glossy Manucode <i>Manucodia ater</i>	aD    bB	2    1--	0    0/-/-	
Twelve-wired Bird of Paradise <i>Seleucidis melanoleucus</i>	R    B	-    ---	-    -/-/-	
Magnificent Riflebird <i>Ptiloris magnificus</i>	aDGR    bcdB	4    432	0–1,208    30–906/113–884/1,025–1,158	isap
* Black-billed Sicklebill <i>Drepanornis albertisi</i>	G    bcd	-    111	-    906/1,137–1,389/1,025	
* Paradigalla <i>Paradigalla</i> sp.?	G    -	-    ---	-    -/-/-	
King Bird of Paradise <i>Cicinnurus regius</i>	aDGRS    bcB	2    21-	189–501    123–280/113/-	arok-arak
* Magnificent Bird of Paradise <i>Diplhyllodes magnificus</i>	aDGR    bcd	4    434	534–1,314    213–906/844–1,437/1,025–1,219	charok-charok
Lesser Bird of Paradise <i>Paradisaea minor</i>	aDGRS    bcB	3    43-	0–854    0–937/0–207/-	wombi, sangan    wombi
* Lesser Ground-Robin <i>Amalocichla incerta</i>	-    cd	-    -44	-    -/1,262–1,437/1,109–1,654	
* Garnet Robin <i>Eugerygone rubra</i>	-    cd	-    -11	-    -/1,405/1,158	
* Yellow-legged Flycatcher <i>Kempiella griseiceps</i>	G    b	-    1--	-    905/-/-	
Olive Flycatcher <i>Kempiella flavovirescens</i>	aDR    bcB	1    21-	690–760    0–491/183/-	
* Papuan Flycatcher <i>Devioeca papuana</i>	G    cd	-    -12	-    -/1,393/1,654	



Scientific and English names	Records	Abundance	Altitude	Local names
* Ashy Robin <i>Heteromyias albispecularis</i>	-    cd	-    -44	-    -/844–1,437/1,025–1,654	
Black-sided Robin <i>Poecilodryas hypoleuca</i>	aDGRS    b	1    3--	457–494    104–579/-/-	
* Smoky Robin <i>Peneothello cryptolenca</i>	G?    cd	-    -34	-    -/1,398–1,437/1,067–1,654	
Banded Yellow Robin <i>Gennaeodryas placens</i>	aGR    bc	4    31-	503–1,134    99–820/494/-	sororo, tuan-tuan
* White-faced Robin <i>Tregellasia lencops</i>	aGR    bcd	2    431	988–1,247    616–906/923–1,189/1,025	
Barn Swallow <i>Hirundo rustica</i>	a    c	1    -1-	122    - /0/-	
Pacific Swallow <i>Hirundo talitica</i>	aDS    c	2    -3-	0–122    -/0/-	yaya
Red-rumped Swallow <i>Cecropis daurica</i>	a    -	1    ---	122    -/-/-	1    ---
* Island Leaf-Warbler <i>Phylloscopus poliocephalus</i>	aGR    bcd	4    434	552–1,261    366–906/884–1,314/1,025–1,219	sikrin
* Black-fronted White-eye <i>Zosterops atrifrons</i>	aDR    b	4    2--	360–787    260–369/-/-	
* Capped White-eye <i>Zosterops fuscicapilla</i>	aGR    d	3    --3	1,170–1,283    -/-/1,025–1,067	
* New Guinea White-eye <i>Zosterops novaeguineae</i>	-    bcd	-    4xx	-    610–905/652–1,194/1,025	
Gray's Grasshopper-Warbler <i>Locustella fasciolata</i>	D    d	-    --1	-    -/-/1,025	
Metallic Starling <i>Aplonis metallica</i>	aDRS    [c]	2    -x-	0    -/x/-	
Singing Starling <i>Aplonis cantoroides</i>	-    bc	-    13-	-    0/0/-	kadadér
Yellow-faced Myna <i>Mino dumontii</i>	aDRS    bc	2    21-	0–575    0–274/0/-	gáwak-gáwak    kowok
Golden Myna <i>Mino anais</i>	aDRS    B	1    ---	69    -/-/-	
* Russet-tailed Thrush <i>Zoothera heinei</i>	-    c	-    -2-	-    -/1,082–1,417/-	
Grey-streaked Flycatcher <i>Muscicapa grisesticta</i>	a    -	1    ---	684    -/-/-	
Olive-crowned Flowerpecker <i>Dicaeum pectorale</i>	aDGRS    bcd	3    212	67–1,207    0–937/1,067/1,025	
Black Sunbird <i>Leptocoma aspasia</i>	DRS    [c]	x    -x-	-    -/x/-	sisi
Olive-backed Sunbird <i>Cinnyris jugularis</i>	aDRS    bc	2    12-	0–122    0/-/-	sisi
Eurasian Tree Sparrow <i>Passer montanus</i>	a    -	4    ---	0–122    -/-/-	
* Blue-faced Parrotfinch <i>Erythrura trichroa</i>	a    d	4    --3	546–1,208    -/-/1,025–1,158	
Grey Wagtail <i>Motacilla cinerea</i>	-    d	-    --2	-    -/-/1,025	

**Unidentified Fakfak Baham names.** Bot'n-bódowit, bot-no-raú, b'roa, dibarása, embó, ganggomba, gauwong, gingenés, gwararé, hágop, hor, iri-iri-tak, jou, ka-aróm, kadua, kambasaré, kawa-kandiri, kendriskom, kilip-kilip, kokowo, kongwongwa, kware, kwa-rong-tuau, kwau, kwiyaras, lís-oros, malington, mia-mia, mitmit, mongoria, muk-múk, n'gwáhen, nimí, paparóyet, paséwa, patatúa, ping, pukwiya, rara, rimen, ruakru, sabu, sambínina, sarap, sausau, sehengádit, sererengop, siaróp, sibiri, sihibúnim, simowóris, siópmu, sirikapáhini, sisalup, sisia, siwon, sopatáni, suane, suatídip, suonet, sup-suópme, suri, suribíyan, surikabáhen, tarahau, timtímu, towerup-towerup, tua, tuwir-tuwir, ungwérom, wadúma, wámindu, weak-weak, wiriri, yiyárop.

**Unidentified Kumawa Baham bird names.** Krua, kuwatútu, lusitúa, manokváu, resin, siringunting.